ATTACHMENT O
Standard Specifications

Rockbridge Road Asbestos Cement Water Main Replacement

December 2016

RFP 16-500426

DeKalb County
Department of Watershed Management

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SECTION 01001
SUMMARY OF WORK

PART 1 – GENERAL

1.01 SCOPE

A. The Work to be performed under this Contract shall consist of furnishing all plants, tools, equipment, materials, supplies, and manufactured articles, and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The Work shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents, which may be necessary for the complete and proper construction of the Work in good faith, shall be provided by the **Contractor** as though originally so indicated, at no increase in cost to the **County**.

B. The quantities shown on the bid form are estimates for the work, including the intended construction method based upon the available information. The assigned means, methods and quantities described herein are subject to revision by the **County** for various reasons, including but not limited to, unforeseen utility conflicts/groundwater, discovery of subsurface rock strata, unforeseen pipeline encasement, etc. As such, a unit price contract type has been selected to prosecute the work and is not intended to be a guarantee for a minimum amount of work.

1.02 PROJECT LOCATION

A. The Work is required at the locations shown on the Approved Drawings or other approved documents by the County.

1.03 WORK COVERED BY THE CONTRACT DOCUMENTS

A. All Work shall be performed according to the requirements of the Contract Documents.

1.04 WORK COORDINATION

A. The **Contractor** shall coordinate the Work with third parties (such as public utilities and telephone company) in areas where such parties may have rights to underground property or facilities; and request maps or other descriptive information as to the nature and location of such underground facilities or property.

B. The **Contractor** shall also coordinate the Work with owners of private and public property where access is required for the performance of the work.

C. The **County** will work with the **Contractor** to assign and schedule the work in a logical and efficient format. However, all items in this contract shall be priced such that each item can be assigned independently or combined with other items at the **County**'s sole discretion in regard to both quantity and scope. The **Contractor** shall perform only those work items directed by the **County** at the prices specified herein. (For example, if the **County** determines that a line segment shall be cleaned but not televised, the same unit price for cleaning shall apply.)

1.05 CONDITIONS AT THE SITES

A. The **Contractor** shall make all necessary investigations to determine the existence and location of underground utilities.

B. The **Contractor** will be held responsible for any damage to and for maintenance and protection of existing utilities, structures, and personal property.

C. Nothing in these Contract Documents shall be construed as a guarantee that such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of the operations.

D. Safety is the responsibility of the **Contractor** at no additional cost to the **County**.

E. In the event Hazardous conditions are encountered, this is to be reported to the **County**.

+++ END OF SECTION 01001 +++

SECTION 01010
PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

Section includes:

1. Lands and Rights-of-Way/Easements
2 Access to and **Contractor's** use of the site
3. Coordination requirements
4. Construction procedures

1.02 LANDS AND RIGHTS-OF-WAY

A. Access to the work shall be limited to the right-of-way or easement area provided for execution of the work. The **Contractor** shall not enter any adjacent private property without prior written approval from the property owner. Proof of such approval shall be furnished to the **County** upon request. All additional permitting required shall be gained by the **Contractor** and is the **Contractor's** responsibility to bear the cost.

B. If the **Contractor** performs any work or service for any property owner outside the specified scope of the **Contractor's** agreement with the **County,** or has any agreements with a private property owner for access to or for temporary use of property outside of the right-of-way or easement area, a written agreement shall be entered into with the private property owner(s) prior to any work or service being performed or prior to any use by **Contractor** of the private property, and such agreement shall be provided to the **County**. The agreement shall contain the following language, in addition to the terms agreed to between the **Contractor** and the property owner.

> "The Property Owner understands that DeKalb County is not a party to this Agreement, exercises no control over the means, methods, and execution of this agreement, and that DeKalb County assumes no responsibility for the **Contractor's** compliance with the terms of this agreement. The **Contractor** shall be solely liable for any and all claims, demands, and judgments related to loss or damage to property or person (including death) arising from or in any way related to the **Contractor's** acts or omissions related to the agreement."

1.03 ACCESS TO AND CONTRACTOR'S USE OF THE SITE

A. The space available to the **Contractor** for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is shown on the drawings.

B. The **County** will continue to utilize the existing wastewater collection system and water system during assessment and construction.

1. The **County** will endeavor to cooperate with the **Contractor's** operations when the **Contractor** has notified the **County** in advance of need for changes in operations in order to accommodate construction operations.
2. The **Contractor** shall conduct the Work so as to cause the least interference with the **County's** operations.

C. All equipment and vehicles used by the **Contractor** on the project shall be marked with the **Contractor's** name and telephone number.

1.04 COORDINATION REQUIREMENTS

A. Coordination with **County**:
1. Limit access through occupied areas to those days and times that the **County** approves. Occupied areas include all areas in which the **County's** regular operations will be going on or to which the **County** requires access during the construction period.
2. When the following must be modified, provide alternate facilities acceptable to the **County**:
   a. Emergency means of egress.
   b. Utilities that must remain in operation.
   c. Informational signage.
3. The **Contractor** shall notify the **County** immediately of any circumstances that may jeopardize or have interrupted utility service.

B. Security Procedures:
1. Limit access to the site to persons involved in the work.
2. Provide secure storage for materials.
3. Secure completed work as required to prevent loss.

C. Coordination of Construction:
1. Inform each party involved, in writing, of procedures required for coordination of the work; include requirements for giving notice, submitting reports, and attending meetings.
2. Inform the **County** in advance, with ample time, when coordination of this work is required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. General Examination Requirements:
1. Prior to performing work, examine the applicable substrates and the conditions under which the work is to be performed.
2. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding.
3. Notify the **County** promptly of any type modifications required due to existing conditions or from previous work.
4. Before starting work that might affect existing construction, verify the existence and location of:
   a. Underground utilities.
   b. Other underground construction.

5. Prepare preconstruction photographic documentation in conformance with the requirements of Section 01380 of these specifications.

B. General Preparation Requirements:
1. Obtain, maintain, and pay for all required permits.
2. Take field measurements as required to properly conduct the work.

C. Cleaning and Protection
1. Keep installed work clean, and clean again when soiled by other operations.

D. Final Cleaning:
1. Remove materials and equipment that are not part of the work and all debris from the site prior to substantial completion.
2. Dispose of debris in a lawful manner.
3. Perform final cleaning after substantial completion has been certified, but before final payment.
4. Clean entire project site and grounds.

E. Substantial Completion:
As stated in GR-1 of the General Requirements

F. Final Completion
As stated in GR-9 of the General Requirements

3.02 HEALTH AND SAFTEY CONSIDERATIONS

A. Take precautions to prevent fires and to facilitate fire-fighting operations.

B. Take precautions to prevent accidents due to physical hazards.

C. Maintain working conditions in order to keep the site and adjacent public ways free of hazardous and unsanitary conditions and public nuisances.

D. Maintain working conditions in order to control rodents and other pests; prevent infestation of adjacent sites and buildings due to pests on this site.

E. Keep public streets free of debris due to this work.

F. Provide adequate traffic control in accordance with current MUTCD standards and the approved traffic permit.

G. When using trenches/excavations, at a minimum follow OSHA standards 29 CFR 1926.650, 29CFR 1926.651, and 29 CFR 1926.652 at

3.03 ENVIRONMENTAL PROTECTION

A. General.

Contractor shall conduct its operation in a manner to prevent pollution of the environment surrounding the area of work by every means possible and shall be responsible for furnishing all necessary items for fulfilling the work described

herein.

B. Material Transport

Contractor shall comply with the Official Code of DeKalb County, Georgia pertaining to the duties of the **Contractor** in hauling material over **County**-owned rights-of-way. This includes, but is not limited to, approval of proposed haul routes, prevention of dropping of materials or debris on the streets from trucks arriving and leaving the site, provision of a suitable vehicle inspection and cleaning installation with permanent crew, and the removal of any material spilled in public areas at no additional cost to the **County**.

C. Waste Materials

No waste or erosion materials shall be allowed to enter natural or manmade water, wastewater collection systems or stormwater drains. Erosion materials from excavations, borrow areas, or stockpiled fill shall be contained within the work area. **Contractor** shall develop methods for control of waste and erosion, which shall include such means as filtration, settlement, and manual removal to satisfy the above requirements.

D. Burning

No burning of waste shall be allowed.

E. Dust Control

The **Contractor** shall at all times control the generation of dust by its operations. Control of dust shall be accomplished by water sprinkling or by other methods approved by the **County.**

F. Noise Control

The **Contractor** shall take every action possible to minimize the noise caused by its operations.

When required by agencies having jurisdiction, noise-producing work shall be performed in less sensitive hours of the day or week as directed by the **County**.

The **Contractor** shall provide equipment that operates with the least possible noise. The use of noisy equipment is prohibited. Hoists and compressor plants shall be electrically operated unless otherwise permitted. The air intake of compressors shall be equipped with silencers, and machinery operated by gearing shall be provided with a type of gearing designed to reduce noise to a minimum. Internal combustion engines shall be equipped with mufflers in good order.

Noise generated by mobile construction equipment, stationary construction equipment, and other equipment involved in the construction of the work shall not exceed the decibel levels indicated below. Noise generated by mobile and stationary construction equipment will be measured 3 to 6 feet from building lines, and on the A weighing network of Type-2 general purpose sound level

meter set at fast response.

	Combined Residential and Commercial
Allowable Sound Levels of Mobile Construction Equipment: - From 7 a.m. to 10 p.m., Monday through Saturday, Except Legal Holidays - At times other than those listed above	85 dBA 70 dBA
Allowable Sound Levels of Stationary Construction Equipment: - From 7 a.m. to 10 p.m., Monday through Saturday, Except Legal Holidays - At times other than those noted above	70 dBA 60 dBA
Night work from 10 p.m. to 7 a.m. shall require an approved special permit from the **County**.	The dBA level will be included in the approved permit.

G. Use of Chemicals

All Chemicals used during construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either EPA or FDA. Use of all such chemicals and disposal of residues shall be in conformance with instructions.

H. By-Passing During Construction

No wastewater shall be by-passed at sewage collection or treatment facilities during project construction unless a by-passing schedule has been approved by the **County.** It shall be the responsibility of the **Contractor** to prepare and secure the approval of any by-passing not specifically identified in the Agreement Documents.

I. Responsibility for Spills and Accidental Discharges

In the event that the **Contractor** causes or has a spill or accidental discharge for which the **County** is fined by the State of Georgia EPD, the **Contractor** agrees to remediate the spill or discharge immediately in accordance with current EPD regulations and to pay any fines assessed against the **County** and/or **Contractor**, and pay for all the **County**'**s** cost associated with efforts to remediate the situation. The **County** shall be notified immediately of such an

event.

J. Odor Control

Contractor shall provide approved temporary odor control measures as required to control objectionable odors resulting from its cleaning and/or bypass pumping operations. Approved temporary odor control measures, when required, shall include odor control filters, additional ventilation, and/or covering of manholes.

3.04 PROTECTION OF THE WORK

A. Conduct construction operations so that no part of the work is subjected to damaging operations or influences that are in excess of those to be expected during normal occupancy conditions.

B. Execute work and stockpile spoils and materials to prevent flooding of excavations, below-grade construction, and adjacent properties due to rainwater runoff.

C. Protect existing property not indicated to be removed.

D. Provide temporary supports as required to prevent movement and structural failure; these shall be designed by a Registered PE in the state of Georgia at the **Contractor's** cost.

E. All equipment and vehicles used on Department of Watershed Management projects shall be clearly marked with the **Contractor's** name and telephone number. The identifying markings may be in the form of magnetic signs, decals, or painted lettering and shall be located on both sides of the equipment/vehicle. The lettering shall be legible, of a contrasting color to the background surface, and at least 2 inches in height. All markings shall be in place upon initiation of the work on the project site.

F. A copy of the project's Notice to Proceed letter issued by the **County** shall be available at all times on the job site as proof of the contractual relationship of the **Contractor** with the **County**. The letter shall be presented for review upon request by regulatory agencies or other **County** departments that visit the job site.

G. If removal and replacement of a paved private driveway is required, the replacement shall be performed within two (2) weeks of removal. The required permanent pavement replacement for public roadways shall be performed within thirty (30) days or within 7 days if the roadway is a state highway or major county arterial roadway. Temporary surface maintenance is the **Contractor's** responsibility and shall be adequate for the volume and type of traffic loads imposed. Temporary asphalt cold mix application, steel traffic plates, etc. shall be utilized as necessary.

H. The **Contractor** shall maintain copies of all permits and approved plans on the project site at all times.

3.05 NOTIFICATION OF SERVICE INTERRUPTION

During progress of work under this Contract, it may be necessary to temporarily interrupt water, sewer, or other utility service to a limited number of customers in the vicinity of the work. It shall be the **Contractor's** responsibility to coordinate the service outage with the utility **County** and to provide proper advance notification (a minimum of 48 hours) to the affected customers.

The **Contractor** is alerted to the fact that due to the nature of businesses and traffic in certain projects' areas, water outages for connections, service changeovers, and other work may not be allowable during normal work hours. Considerations of this are to be factored into the bid price submitted. Coordination, special lighting, traffic control, employee overtime, special customer notification, etc. shall be included in these considerations by the **Contractor**.

END OF SECTION 01010

SECTION 01014
WORK SEQUENCE

PART 1 - GENERAL

1.01 SCOPE

A. Work under this Section includes construction sequencing and provision of temporary facilities necessary to maintain the efficiency of the water distribution facilities and to prevent potable water bypasses during the performance of the Work.

B. The existing water distribution system is currently and continuously pumping potable water, and those functions shall not be interrupted except as specified herein. The **Contractor** shall coordinate the work to avoid any interference with normal operation of the distribution system. The **Contractor** shall comply with the following general requirements:

1. Provide temporary pumps and other facilities necessary to meet the requirements of this Section.

2. Notify the **County** at least 48 hours prior to starting to relocate piping or taking existing components out of service.

3. Bypassing of untreated or partially treated sewage to surface waters or drainage courses is prohibited during construction. In the event accidental bypassing is caused by the **Contractor's** operations, the **County** shall immediately be entitled to employ others to stop the bypassing without giving written notice to the **Contractor**.

C. Penalties imposed on the **County** as a result of any bypass caused by the actions of the **Contractor**, its employees, or subcontractors, shall be borne in full by the **Contractor**, including legal fees, clean up, remediation, and other expenses to the **County** resulting directly or indirectly from the bypass.

1.02 SUBMITTALS

A. In accordance with the General Conditions, the **Contractor** shall submit a detailed outage plan and time schedule for operations that will make it necessary to remove a pipeline or structure from service. The schedule shall be coordinated with the construction schedule specified in the Section and shall meet the restrictions and conditions specified in this section. The detailed plan shall describe the **Contractor's** method for preventing bypassing, the length of time required to complete said operation, the necessary plant, and equipment which the **Contractor** shall provide in order to prevent bypassing..

B. Sequence Submittal: The sequence provided in Part 3 of this Section is offered as a suggestion to the **Contractor**. The **Contractor** shall submit a proposed detailed sequence with appropriate times of starting and completion of tasks to the **County** for review.

C. Alternate Sequences: The **Contractor** may propose alternate sequences to those shown in Part 3 of this Section in an attempt to reduce the disruption of the operation of the existing facility or streamline the tasks of this Contract.

1.03 QUALITY ASSURANCE

A. At least two weeks prior to any proposed activity that will require any portion of the water distribution system to be removed from operation, require bypassing, or require interruption of flow, the **Contractor** shall schedule a meeting with DWM Operating Personnel and the **County**. At this meeting, the **Contractor** shall present the **Contractor's** detailed plan for the proposed operation for general discussion. The plan shall meet the minimum requirements below:

1. Plan shall be written outline form and presented in a format that shows the progression of events in sequential and/or concurrent order of activity and the duration of each activity.

2. The written plan shall be supplemented by drawings, sketches, and details as required to show the logic of the plan and make it understandable.

3. The plan shall delineate the responsibilities of the DWM Operating Personnel and the **Contractor**, so as to eliminate any delay due to conflicting viewpoints upon implementation of the plan.

4. After discussion of the plan at the meeting, any changes agreed upon shall be incorporated into the plan and a copy of the plan and details shall be distributed to DWM Operating Personnel, the **County**, and **Contractor** personnel at least one week prior to commencement of activities. On the day prior to commencement of activity, a brief meeting of involved parties shall be convened. In this meeting, the starting time and initial activity of DWM Operating Personnel and **Contractor's** personnel shall be agreed upon.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

The sequence of construction is outlined for the major items of Work required. The **Contractor** shall coordinate its work with the DWM Operating Personnel to minimize disruptions of system operation. It shall be the **Contractor's** responsibility to ensure that all existing facilities are protected and will not be damaged as a result of this construction. No settlement of existing facilities will be acceptable and all work shall be performed in a safe manner.

3.02 PROPOSED CONSTRUCTION SEQUENCE

The project shall be constructed in five stages that will permit continuous operation of the facilities and provide treatment of wastewater to a quality equivalent to or better than the existing secondary treatment plant at all times. The five stages of construction shall generally be performed in sequence, with overlap as required to maintain the treatment facilities in service. The five stages proposed are:

Step 1 - Preparatory
Step 2 - New Pipe, Structures, Valves, and Connections
Step 3 - Modification to Existing Facilities
Step 4 – Bypass Facilities
Step 5 - Cleanup and Final Restoration

3.03 REQUIRED SEQUENCES

The following items define the order of certain construction steps that must occur in order to properly and safely operate and maintain the treatment facilities.

3.04 COORDINATION WITH OTHER CONTRACTORS

The performance of the project shall be coordinated with other work going on at the same time on the project site. Certain portions of the project are required to be completed so that others can perform their work in a timely manner. The construction schedule prepared by the **Contractor** shall take in account the intermediate requirements depicted on their sequence diagram.

3.05 LIMITS OF CONSTRUCTION

Due to the requirement for other contractors to be performing work on the site, **Contractor's** access to the site may be limited. The **Contractor** shall have access to some areas of the site only during certain steps during construction. The **Contractor** shall have access to the property defined within the construction limits throughout the project. Additionally, it shall have access to areas within the construction limit of others for only the periods of time required to perform the work

A. Except where indicated otherwise on the drawings, all pipeline and underground construction shall terminate at the construction limit lines indicated on the drawings. The **Contractor** reaching the construction limit first shall be responsible for adequately capping the line to both allow for testing and for easy continuation of or connection to the line by the **Contractor** continuing the line.

B. The **Contractor** may be responsible for performing work within the construction limits of other contractors

3.06 MISCELLANEOUS CONSTRUCTION

Miscellaneous work necessary to complete any flow diversion required may include piping, electrical work, diversion plugs, bulkheads, equipment installation, easements, permits, etc. The cost for these items shall be included in the **Contractor's** base bid.

+++END OF SECTION 01014 +++

SECTION 01016
OCCUPANCY

PART 1 – GENERAL

1.01 PARTIAL OCCUPANCY BY COUNTY

A. Whenever, in the opinion of the **County**, any section or portion of the Work is in suitable condition, it may be put into use upon the written order of the **County** and such usage will not be held in any way as an acceptance of said work, or any part thereof, or as a waiver of any of the provisions of these Specifications and the Contract. Pending completion and final acceptance of the Work, all necessary repairs, and replacements, due to defective materials or workmanship or operations of the **Contractor**, for any section of the Work so put into use shall be performed by the **Contractor** at **Contractor's** own expense.

+++ END OF SECTION 01016 +++

SECTION 01040
COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. The **Contractor** shall coordinate execution of the Work with subcontractors and the **County** as required to maintain operation of the existing facilities and satisfactory progress of the Work.

B. Requirements of this Section will be in addition to those stated in the General Requirements.

C. The **County** shall require a written explanation of the **Contractor's** plan for accomplishing separate phases of the Work.

1.02 EXISTING UTILITIES

A. Consult with the **County** on a daily basis while the **Contractor** is performing demolition, excavation, or any other alteration activity. No water or sewer function, utility, or structure is to be altered, shut off, or removed unless approved in advance, and in writing, by the **County**. The **Contractor** shall give the **County** at least 48 hours advanced notice, in writing, of the need to alter, shut off, or remove such function.

B. Coordinate the Work with the **County** and revise daily activities if needed so as to not adversely affect system operations. Such revisions in the proposed work schedule shall be accomplished with no additional compensation to the **Contractor**.

+ + + END OF SECTION 01040 + + +

SECTION 01045
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DEFINITIONS

A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition
   1. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
   2. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching."
   3. "Demolition" and "Selective Demolition" are recognized as related- but-separate categories of work, which may or may not require cutting and patching as defined in this section; refer to "Demolition" and "Selective Demolition" sections of Division 2.

B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
   1. Unless otherwise specified, requirements of this section apply to mechanical and electrical work. Refer to Division-15 and Division-16 sections for additional requirements and limitations on cutting and patching of mechanical and electrical work

1.02 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
   1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division-15 and Division 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.03 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including; General Requirements and other Division-1 Specification Sections, apply to this section.

1.04 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load-deflection ratio.
   1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems.
      a. Primary operational systems and equipment
      b. Air or smoke barriers
      c. Water, moisture, or vapor barriers
      d. Fire Protection Systems

e. Control Systems
f. Communication systems
g. Conveying system
h. Noise and vibration control elements and systems

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decrease operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in visually unsatisfactory manner.
1. If possible, retain the original installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.
a. Stonework and stone masonry
b. Window wall systems
c. Ornamental metal
d. Firestopping
e. Stucco and ornamental plaster
f. Carpeting
g. Wall Coverings

D. Before cutting and patching, temporarily or permanently, of the following categories of work, obtain approval to proceed.
1. Structural steel
2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work
a. Structural concrete
b. Foundation construction
c. Steel
d. Lintels
e. Bearing and retaining walls
f. Structural decking
g. Exterior curtain wall construction
h. Equipment supports
i. Piping, ductwork, vessels and equipment
j. Structural systems of special construction, as specified by Division- 13 sections
k. Shoring, bracing, and sheeting
l. Primary operational systems and equipment
m. Water/moisture/vapor/air/smoke barriers, membranes and flashings
n. Noise and vibration control elements and systems
o. Control, communication, conveying, and electrical wiring systems

E. Installer Qualifications: Company specializing in performing the work of this section with a minimum 5 years of experience.

F. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.05 SUBMITTALS

A. Procedural Proposal for Cutting and Patching: Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:
   1. Describe the nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational, and visual changes, as well as other significant elements.
   2. List products to be used and firms to be involved, including their qualifications to perform work.
   3. Give dates when work is expected to be performed.
   4. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out of service temporarily. Indicate how long utility service will be disrupted.
   5. Be aware that approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.
   6. When cutting and patching of structural work involves the addition of reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with the original structure to satisfy requirements.
   7. Ensure that all structural welding is performed by a certified welder.

1.06 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged with methods and materials in such a manner as not to void any warranties required or existing.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Except as otherwise indicated, or as directed by the Contracting Officer, use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use compatible materials matching existing adjacent surfaces to the fullest extent possible also with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

Note that the use of a trade name and suppliers name and address is to indicate a possible source of the product. Products of the same type from other sources shall not be excluded provided they possess like physical and functional characteristics.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and the conditions under which cutting and patching is to be performed. Take corrective action before proceeding if unsafe or unsatisfactory conditions are encountered.

Before the start of cutting work, meet at the work site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict between the various trades. Coordinate layout of the work and resolve potential conflicts before proceeding with the work

3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut. If the cut is on a structural member a temporary support design plan shall be submitted to the **County** for approval by a registered PE in the state of Georgia.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take precautions necessary to avoid cutting existing pipe conduit, or ductwork serving the building, but schedule to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

B. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original conditions.

C. Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.
   1. In general, where cutting is required, use hand or small tools designed for sawing or grinding, no hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. To avoid marring existing finish surfaces, cut the exposed or finished side into concealed surfaces.
   3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
   4. Comply with requirements of applicable Sections or Division-2 where cutting and patching require excavating and backfilling.
   5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

D. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
   1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
   2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. When removal of walls or partitions extends one finish area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, as necessary to achieve uniform color and

appearance.

a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.

4. Patch, repair, or rehang existing ceiling as necessary to provide an even surface of uniform appearance.

3.04 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Completely remove paint, mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit and similar features before paint or other finishing is applied. Restore damaged pipe covering to its original conditions.

B. Do not permit traffic over unprotected floor surface.

+++ END OF SECTION 01045 +++

SECTION 01060
REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. Permits and Responsibilities: The **Contractor** shall, without additional expense to the **County**, be responsible for obtaining National Pollutant Discharge Elimination System (NPDES) permits for stormwater discharges from this project, and for complying with any applicable federal, state, county, and municipal laws, codes, and regulations, in connection with the prosecution of the Work.

B. The **Contractor** shall take proper safety and health precautions to protect the Work, the workers, the public, and the property of others.

C. The **Contractor** shall also be responsible for all materials delivered and work performed until completion and acceptance of the Work, except for any completed unit of construction thereof that may heretofore have been accepted.

1.02 NPDES PERMITS FOR STORMWATER DISCHARGES

A. The Federal Water Pollution Control Act (also known as the Clean Water Act, or CWA), as amended in 1987, requires NPDES permits for stormwater discharges associated with industrial activity.

B. On November 16, 1990, (55 FR 47990), the U.S. Environmental Protection Agency (EPA) issued regulations establishing permit application requirements for storm water discharges associated with industrial activity. These regulations are primarily contained in Section 122.26 of Section 40 of the Code of Federal Regulations (40 CFR Part 122.26).

C. The November 16, 1990 regulation established the following definition of "stormwater discharge associated with industrial activity" at 40 CFR 122.26(b)(14):

"Stormwater discharge associated with industrial activity" means the discharge from any conveyance which is used for collecting and conveying stormwater and which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. For the categories of industries identified in subparagraphs (i) through (x) of this subsection, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at 40 CFR 401); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and

finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. The following categories of facilities are considered to be engaging in "industrial activity" for purposes of this subsection:

(ix) and (xi) omitted for brevity.

(x) Construction activity, including clearing, grading and excavation activities except: operations that result in the disturbance of less than five acres of total land area which are not part of a larger common plan of development or sale;

D. These regulations are effective for all activities covered by the regulation on or after October 1, 1992.

E. As a minimum, the **Contractor** shall complete EPA Form 3510-2F. A manual entitled "Guidance Manual for the Preparation of NPDES Permit Applications for Stormwater Discharges Associated With Industrial Activity" as published by the EPA, is available to assist the **Contractor** in the application process.

+++ END OF SECTION 01060 +++

SECTION 01100
SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 CONNECTIONS TO EXISTING SYSTEMS

A. The **Contractor** shall perform all work necessary to locate, excavate, and prepare for connections to the terminus of the existing systems as shown on the Drawings. The cost for this work and for the actual connection to the existing systems shall be included in the bid price for the project and shall not result in any additional cost to the **County**. Connections shall be made only after approval by the **County**.

1.02 RELOCATIONS

A. The **Contractor** shall be responsible for the relocation of structures, including but not limited to light poles, signs, sign poles, fences, piping, conduits, and drains that interfere with the positioning of the Work as set out on the Drawings. The cost of all such relocations shall be included in the bid price.

1.03 EXISTING UNDERGROUND PIPING, STRUCTURES, AND UTILITIES

A. The attention of the **Contractor** is drawn to the fact that during excavation, the possibility exits of the **Contractor** encountering various sewer, water, gas, telephone, electrical, or other utility lines not shown on the Drawings. The **Contractor** shall exercise extreme care before and during excavation to locate and flag these lines so as to avoid damage to the existing lines. Should damage occur to an existing line, the **Contractor** shall bear all costs associated with the damage and repair the line at no cost to the **County.**

B. The locations of existing underground piping structures and utilities are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.

C. The existing piping and utilities that interfere with new construction shall be rerouted as shown, specified, or required. Before any piping and utilities not shown on the Drawings are disturbed, the **Contractor** shall notify the **County** of the location of the pipeline or utility and shall reroute or relocate the pipeline or utility as directed.

D. The **Contractor** shall exercise care in any excavation to locate all existing piping and utilities. All utilities, which do not interfere with complete work, shall be carefully protected against damage. Any existing utilities damaged in any way by the **Contractor** shall be restored or replaced by the **Contractor** at its expense as directed by the **County**.

1.04 HAZARDOUS LOCATIONS

A. The existing wet wells, manholes, and related areas are hazardous locations, in that explosive concentrations of sewage gas may be present. The **Contractor** is cautioned that the above areas, especially the wet well, may be deficient in oxygen. Checks shall be made by the **Contractor** whenever personnel are working in these areas to

determine whether adequate oxygen is available.

1.05 CONNECTIONS TO WORK BY OTHERS

A. Pipelines constructed under this Contract may be connected to pipelines to be built by others.

B. Pipelines built under this Contract may be connected to pipelines constructed by others by removing the plugs and making the connection.

C. If the pipelines have not been constructed by others, the pipeline (under this Contract) shall be laid to the required line and grade, terminated with a plugged connection, precisely at the location indicated on the Drawings and then backfilled and marked with a yellow stake exposed a minimum of 3 feet above grade.

1.06 WATER FOR CONSTRUCTION PURPOSES

A. The **Contractor** shall be responsible for any cost of water used on the Project. A water meter and backflow device must be obtained from the main office of the DeKalb County Department of Watershed Management for recording water usage used for cleaning and other work items requiring water.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+ + + END OF SECTION 01100 + + +

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

A. The **County** shall schedule and administer a preconstruction meeting and may schedule periodic progress meetings, and specially called meetings throughout progress of the Work. The **County** shall set the agenda for the meetings and preside at the meetings. The **Contractor** shall make physical arrangements for the meetings pursuant to the **County's** requirements. Meetings are not a pay item.

B. Representatives of the **Contractor**, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 PRECONSTRUCTION MEETING

A. The **County** shall schedule a Preconstruction Meeting prior to the start of construction.

B. The Preconstruction Meeting shall be attended by the following:
1. **County's** representative(s)
2. **Contractor's** Superintendent
3. Others as appropriate

C. The Preconstruction Meeting will generally have the following agenda:
1. Designation of responsible personnel
2. Distribution and discussion of list of major subcontractors and suppliers
3. Projected construction schedule with critical work sequencing
4. Major equipment deliveries and priorities
5. Procedures and processing of:
    a. Submittals
    b. Requests for Information
    c. Proposed Change Requests
    d. Field Decisions
    e. Applications for Payment
    f. Change Orders
6. Procedures for maintaining Record Documents
7. Periodic Meeting Schedule

1.03 PERIODIC PROGRESS MEETINGS

A. The **County** may schedule periodic progress meetings throughout the project duration. The necessity of and frequency of any periodic progress meetings will be determined by the **County** based on individual project requirements.

B. The periodic progress meetings shall be attended by the following:
1. **County's** representative(s)
2. **Contractor's** representative(s)
3. Others as appropriate

C. The periodic progress meetings will generally have the following agenda:

1. Review work progress since last meeting
2. Discussion of Construction Schedule for next period
3. Status of major equipment and material deliveries
4. Construction problems impacting progress
5. Field observations
6. Status of pending changes
7. Stakeholder complaints/public outreach
8. Status of permits
9. Status of invoicing
10. Other business

1.04 OTHER MEETINGS

A. Specially-called meetings will be held as warranted by unforeseen developments during construction or as needed to coordinate special events, such as tie-ins or system shutdowns.

B. Specially-called meetings may be requested by either party or by other affected entities. Requests shall be made through the **County**, which shall coordinate the meeting schedule.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+++ END OF SECTION 01200 +++

SECTION 01210
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 SCOPE

A. Work includes furnishing all plant, labor, equipment, tools, materials, and performing all operations required to complete the Work satisfactorily, in-place, as specified, and as indicated in RFP 16-500398.
B. All costs of required items of work and incidentals necessary for the satisfactory completion of the Work shall be considered as included in the Total Bid. The cost of work not directly covered by the pay items shall be considered incidental to the contract and no additional compensation shall be allowed.
C. The **Contractor** shall take no advantage of any apparent error or omission on the Drawings or Specifications, and the **County** shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.

1.02 SUBMITTALS

A. The **Contractor** shall submit to the **County** for approval, in the form directed or acceptable to the County, a complete schedule of values of the various portions of the Work, including quantities and unit prices, aggregating the Contract Price. An unbalanced breakdown providing for overpayment to the **Contractor** on items of Work, which would be performed first, will not be approved.
B. Submit application for payment on a form approved by the **County** showing allowances, lump sum schedule of value items, and unit price items in accordance with Section 01310.

1.03 UNIT PRICE ITEMS

A. Payment for all work shall be in accordance with the unit price bid items in the Bid Schedule and shall be full compensation for all labor, materials, and equipment required to furnish, install, construct, and test the Work covered under the unit price bid item. Work for which there is no price schedule item will be considered incidental to the Work and no additional compensation shall be allowed.
B. Payment will be made only for the actual quantities of work performed in compliance with the Drawings and Specifications. The **Contractor** will be paid an amount equal to the approved quantity times the applicable unit price. Any unused balance of the unit price work shall revert to the **County** upon completion of the project.
C. All unit price work shall be considered as part of the Work to be performed within the time limits specified elsewhere for Substantial Completion and Project Completion. No increase in contract time will be allowed for increases in quantities of unit price work performed beyond the quantities shown in the Bid Schedule, unless it can be demonstrated that the additional Work performed under the unit price item is on the critical path of the Project Schedule and has produced an increase in time to the contract.

1.04 MEASUREMENT OF QUANTITIES

A. Final payment quantities shall be determined from the record drawings. The record drawing lengths, dimensions, quantities, etc. shall be determined by a survey after completion of all

required work. The precision of final payment quantities shall match the precision shown for that item in the Bid Schedule. Measurements will be taken according to the United States standard measurements and in the manner as specified in these Specifications.

B. Measurement Devices
   1. Scales shall be inspected, tested, and certified by the applicable Weights and Measures Department within the past year and shall be of sufficient size.
   2. Metering devices shall be inspected, tested, and certified by the applicable department within the past year.
   3. Volume shall be determined by cubic dimension by multiplying mean length by mean width by mean height or thickness.
   4. Area shall be determined by square dimension by multiplying mean length by mean width or height.
   5. Linear measurement shall be measured by linear dimension, along the item centerline or mean chord.
   6. Stipulated price measurement shall include items measured by number, weight, volume area, length or combination thereof as appropriate.

Item	Method of Measurement
AC	Acre - Field Measure
AL	Allowance
CY	Cubic Yard - Field Measure within limits specified or shown, or measured in vehicle by volume, as specified
EA	Each - Field Count
GAL	Gallon - Field Measure
HR	Hour
LB	Pound(s) - Weight Measure by Scale
LF	Linear Foot - Field Measure
LS	Lump Sum - Unit is one; no measurement will be made
SF	Square Foot
SY	Square Yard
TON	Ton - Weight Measure by Scale (2,000 pounds)
VF	Vertical Foot - Field Measure

SECTION 1 – UNIT PRICE BID ITEMS

Part A: Project Development Costs

1. Engineering and Design Costs

A. The measurement for payment for Engineering and Design Costs shall be the lump sum price stated in the Rate Proposal Form.

B. The lump sum price shall include all necessary time and materials to design the Work in accordance with the Contract Requirements and all local, state and federal requirements. This includes but is not limited to 30%, 60%, 90%, and 100% design packages, surveying, geotechnical, subsurface utility engineering, and easement acquisitions,

C. Payment shall be made based on work performed during each work period.

2. Permitting

A. The measurement for payment for Permitting shall be the lump sum price stated in the Rate Proposal Form.

B. The lump sum price shall include all necessary time and materials to obtain and maintain all required local, state, and federal permits to perform the Work throughout the life of the contract. Refer to Attachment L of the RFP for permit

requirements.

C. Payment shall be made based on work performed during each work period.

Part B: Paving

3. Traffic Control

A. The measurement for payment for Traffic Control shall be the lump sum price stated in the Rate Proposal Form.

B. The lump sum price shall include all necessary signage, flagmen, detours, traffic control plans, and related requirements of GDOT or DeKalb County.

C. Payment shall be made based on work performed during each work period.

4. Mill Asphalt Concrete Pavement, 2 inch depth

A. Milling asphaltic concrete pavement, measured as specified, will be paid for in the lump sum price stated in the Rate Proposal Form.

B. Payment is full compensation for furnishing equipment, milling, hauling, and disposing milled material, and satisfactorily performing the work.

5. Recycled Asphaltic Concrete 12.5 MM Superpave Including Bitum Material & H Lime, 2-inch depth

A. Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons. The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway.

B. The work performed and the materials furnished as described in this Specification will be paid for in the lump sum price stated in the Rate Proposal Form. Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor tools, equipment, and incidentals necessary to complete the work, including hauling and disposing of reclaimed asphalt pavement (RAP) or reclaimed asphalt shingles (RAS) material.

C. Any pavement damaged outside the payment width shall be repaired and no additional payment will be allowed for such work outside the payment width.

6. Asphalt Concrete Leveling

A. Payment of hot mix asphaltic concrete leveling is included in the lump sum price stated in the Rate Proposal Form, regardless of the type mix, is full compensation for furnishing materials, bituminous materials, and hydrated lime (when required) for patching and repair of minor defects, surface preparation, cleaning, hauling, mixing, spreading, and rolling.

7. Miscellaneous Paving Items

A. The measurement for payment for miscellaneous paving items shall be included in the lump sum price stated in the Rate Proposal Form.

B. The lump sum price shall include all necessary striping, pavement markers, loop detectors, and any other items necessary to meet all local and state requirements of the Project that were not included in other bid items.

C. Payment shall be made based on Work performed during each Work Period.

Part B-1: Concrete Deep Patch (Patching width of 5 feet or less)

8. Recycled Asphalt Concrete 12.5-MM Superpave, including Bitum Material and H Lime

A. Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons and shall be spread at a rate of 165 LB/SY. The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway. This line item shall only be used at the

discretion of DWM or its representative.

B. The work performed and the materials furnished as described in this Specification will be paid for in the lump sum price stated in the Rate Proposal Form. Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor tools, equipment, and incidentals necessary to complete the work, including hauling and disposing reclaimed asphalt pavement (RAP) or reclaimed asphalt shingles (RAS) material.

C. Any pavement damaged outside the payment width shall be repaired and no additional payment will be allowed for such work outside the payment width.

9. 8-inch Class B Concrete

A. The area that will be paid for under this item is the number of cubic yards of concrete poured in the road right of way as required in the Specifications and accepted as measured complete in place. The final thickness shall be 8 inches throughout the entire length of the project. This line item shall only be used at the discretion of DWM or its representative.

B. No additional payment over the Contract lump sum price will be made for concrete with an average thickness greater than required in the Specifications. No additional payment over the Contract lump sum price will be made for a lot of concrete that develops more strength at 28 days than the required compressive strength in the Specifications.

C. Payment is full compensation for furnishing and placing materials, reinforcements, dowel and joint materials, supplies, and incidentals to complete the work.

10. 8-inch Graded Aggregate Base

A. Graded aggregate base shall be measured by the square yard with a final thickness of 8 inches, complete and in place. This line item shall only be used at the discretion of DWM or its representative.

B. Graded aggregate base will be paid for in the lump sum price stated in the Rate Proposal Form, complete, in place, and accepted. This payment shall be full compensation for: materials, shaping and compacting the existing roadbed, loading, hauling, unloading, crushing and processing, mixing, spreading, watering, compacting and shaping, maintenance, priming when required, and all incidentals necessary to complete the Work.

Part B-2: Asphalt Deep Patch (Patching width greater than 5 feet)

11. Recycled Asphalt Concrete 12.5-MM Superpave, including Bitum Material and H Lime

A. Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons and shall be spread at a rate of 165 LB/SY. The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway. This line item shall only be used at the discretion of DWM or its representative.

B. The work performed and the materials furnished as described in this Specification will be paid for in the lump sum price stated in the Rate Proposal Form. Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor tools, equipment, and incidentals necessary to complete the work, including hauling and disposing reclaimed asphalt pavement (RAP) or reclaimed asphalt shingles (RAS) material.

C. Any pavement damaged outside the payment width shall be repaired and no

additional payment will be allowed for such work outside the payment width.

12. Recycled Asphalt Concrete 19-MM Superpave, including Bitum Material and H Lime

A. Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons and shall be spread at a rate of 220 LB/SY. The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway. This line item shall only be used at the discretion of DWM or its representative.

B. The work performed and the materials furnished as described in this Specification will be paid for in the lump sum price stated in the Rate Proposal Form. Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor tools, equipment, and incidentals necessary to complete the work, including hauling and disposing reclaimed asphalt pavement (RAP) or reclaimed asphalt shingles (RAS) material.

C. Any pavement damaged outside the payment width shall be repaired and no additional payment will be allowed for such work outside the payment width.

13. Recycled Asphalt Concrete 25-MM Superpave, including Bitum Material and H Lime

A. Recycled asphaltic concrete mixture, complete in place and accepted, is measured in tons and shall be spread at a rate of 660 LB/SY. The weight is determined by recorded weights if an approved recording device is used. Or, the weight is determined by weighing each loaded vehicle on an approved motor truck scale as the material is hauled to the roadway. This line item shall only be used at the discretion of DWM or its representative.

B. The work performed and the materials furnished as described in this Specification will be paid for in the lump sum price stated in the Rate Proposal Form. Payment is full compensation for providing materials, hauling and necessary crushing, processing, placing, rolling and finishing the recycled mixture, and providing labor tools, equipment, and incidentals necessary to complete the work, including hauling and disposing reclaimed asphalt pavement (RAP) or reclaimed asphalt shingles (RAS) material.

C. Any pavement damaged outside the payment width shall be repaired and no additional payment will be allowed for such work outside the payment width.

14. 8-inch Graded Aggregate Base

A. Graded aggregate base shall be measured by the square yard with a final thickness of 8 inches, complete and in place. This line item shall only be used at the discretion of DWM or its representative.

B. Graded aggregate base will be paid for in the lump sum price stated in the Rate Proposal Form, complete, in place, and accepted. This payment shall be full compensation for: materials, shaping and compacting the existing roadbed, loading, hauling, unloading, crushing and processing, mixing, spreading, watering, compacting and shaping, maintenance, priming when required, and all incidentals necessary to complete the Work.

Part C: Water Mains

15. Traffic Control

A. The measurement for payment for Traffic Control shall be the lump sum price stated in the Rate Proposal Form.

B. The lump sum price shall include all necessary signage, flagmen, detours, traffic control plans and related requirements of the GDOT or the **County**.

C. Payment shall be made based on work performed during each work period.

16. Erosion Control

A. Measurement for all Erosion Control shall be one lump sum.
B. The lump sum price for erosion control measures will include but is not limited to all labor, materials, equipment, sampling, permit fees, maintenance, re-placement, inspections, water quality monitoring, laboratory analysis, restoration, removal, temporary and permanent grassing, and all other items and work to fully execute the requirements of the Work, including Georgia Erosion Control Regulations and all local, state and federal requirements.
C. Payment shall be made based on work performed during each work period.

17. Landscaping

A. The measurement for payment for Landscaping shall be the lump sum price stated in the Rate Proposal Form.
B. The lump sum price shall include all necessary labor, materials, equipment, maintenance, restoration, temporary and permanent grassing, shrub and tree planting, structure restoration, and all other items and work to fully execute the requirements of the Work and restore all landscaping to original conditions or better throughout the length of the project.
C. Payment shall be made based on work performed during each work period.

18. Driveway Cut Restoration

A. Measurement for payment for gravel, concrete, and asphalt driveway replacement shall be the actual number of square yards of driveway replaced.
B. Included in the lump sum bid item shall be subgrade preparation, providing stone equal or similar to existing, grading, and other incidental work to replace driveway to original condition, including culvert replacement.
C. No extra payment will be made for items included in other lump sum items.

19. Sidewalk Restoration

A. Measurement for payment for concrete sidewalk replacement shall be included in the lump sum item stated in the Rate Proposal Form.
B. Payment will be full compensation for furnishing all labor, materials, tools, and equipment necessary to install and finish concrete sidewalk and shall include: excavation; backfilling; compaction; restoration of property; disposal of existing materials; all joints; all special construction at driveways or other entrances and points; hauling and placing materials; and incidentals necessary to complete the work. Payment shall include all approaches through curb and gutter indicated on the Plans
C. No extra payment will be made for work included in other lump sum items.

20. Curb and Gutter Restoration

A. Measurement for payment of concrete curb and gutter, concrete curb, or granite curb and concrete valley gutter shall be included in the lump sum item stated in the Rate Proposal Form
B. Payment will constitute full compensation for all work necessary to install the curb and gutter, including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, excavation, backfilling, compaction, placement, restoration of property, disposal of existing materials, all joints, all special construction at driveways and other entrances or points, and cleanup. Payment shall include all approaches through curb and gutter indicated on the Plans.
C. No extra payment will be made for work included in other lump sum items.

21. Concrete Encasement, 12 Inches Thick

A. The lump sum item stated in the Rate Proposal Form shall include the number of cubic yards of concrete encasement installed around the water main as required in

the Specifications and accepted as measured complete in place. The concrete encasement shall be Class B and 12 inches thick.

B. No additional payment over the contract unit price will be made for concrete with an average thickness greater than required in the Specifications. No additional payment over the contract lump sum price will be made for a lot of concrete that develops more strength at 28 days than the required compressive strength in the Specifications.

C. Payment is full compensation for furnishing and placing materials, reinforcements, dowel and joint materials, supplies, and incidentals to complete the work.

22. Concrete Cap

A. The lump sum item stated in the Rate Proposal Form shall include the number of cubic yards of concrete poured over the trench width in the road right of way as required in the Specifications and accepted as measured complete in place. The final concrete cap shall be 8 inches thick throughout the entire length of the project.

B. No additional payment over the contract lump sum price will be made for concrete with an average thickness greater than required in the Specifications. No additional payment over the contract unit price will be made for a lot of concrete that develops more strength at 28 days than the required compressive strength in the Specifications.

C. Payment is full compensation for furnishing and placing materials, reinforcements, dowel and joint materials, supplies, and incidentals to complete the work.

23. Polyethylene Encasement, water main

A. Measurement for payment for polyethylene encasement shall be included in the lump sum price stated in the Rate Proposal Form.

B. Payment will constitute full compensation for all work necessary for a complete installation including, but not limited to, labor, materials and supplies, and equipment required for the handling and installation of the encasement, on-site storage, delivery to the work areas, site preparation, complete restoration, and cleanup not included in other items..

24. Steel Casing, Bore and Jack Installation 8-Inch-Diameter Pipe

A. Measurement for payment for Jacking and Boring shall be included in the lump sum price stated in the Rate Proposal Form.

B. Payment will constitute full compensation for all work necessary for a complete installation including, but not limited to, labor, materials and supplies, and equipment required for the handling and installation of the casing and carrier pipe, access and receiving shafts, shaft support, shoring and bracing removal, groundwater control, annular space fill, spacers, casing end plugs and other associated materials, and surface settlement monitoring, on-site storage, delivery to the work areas, site preparation, backfill, complete restoration and cleanup.

25. Steel Casing, Bore & Jack Installation 6-Inch-Diameter Pipe

A. Measurement for payment for Jacking and Boring shall be included in the lump sum price stated in the Rate Proposal Form.

B. Payment will constitute full compensation for all work necessary for a complete installation including, but not limited to, labor, materials and supplies, and equipment required for the handling and installation of the casing and carrier pipe, access and receiving shafts, shaft support, shoring and bracing removal, groundwater control, annular space fill, spacers, casing end plugs and other associated materials, and surface settlement monitoring, on-site storage, delivery to the work areas, site preparation, backfill, complete restoration and cleanup.

26. Free Bore Installation, 8-Inch-Diameter Pipe

A. Pipe installed by boring is measured by the linear foot of pipe complete in place.

Measurement is made between the ends of the pipe along the control axis as installed**.**

B. Work performed and materials furnished as prescribed by this item and measured as provided will be paid under the lump sum item stated in the Rate Proposal Form for boring of the pipe type, size, and class specified**.** Payment is full compensation for furnishing the pipe and the incidentals to complete the item.

C. Excavation will not be paid for separately.

27. Free Bore Installation, 6-Inch-Diameter Pipe

A. Pipe installed by boring is measured by the linear foot of pipe complete in place. Measurement is made between the ends of the pipe along the control axis as installed**.**

B. Work performed and materials furnished as prescribed by this item and measured as provided will be paid under the lump sum item stated in the Rate Proposal Form for boring of the pipe type, size, and class specified**.** Payment is full compensation for furnishing the pipe and the incidentals to complete the item.

C. Excavation will not be paid for separately.

28. Flowable Fill

A. Flowable fill shall be paid for under the lump sum item stated in the Rate Proposal Form for number of cubic yards of flowable fill complete in place and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, flushing, plugging air release valves and service connections, installation of flowable fill, plugs, and caps, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, proper disposal of all types and sizes of pipe materials removed to install flowable fill, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the flowable fill.

29. Water Main, 8-Inch-Diameter DIP, Push On Joint

A. Measurement for payment of furnishing and installing ductile iron water distribution pipe will be included under the lump sum item stated in the Rate Proposal Form on a linear foot basis as determined by measurement along the centerline of the pipe in-place.

B. Payment will constitute full compensation for all work necessary for installation of ductile iron water distribution pipe, including but not limited to furnishing, transporting, storing, and installing the pipe, fittings, ground penetrating radar pipe location along the pipeline route, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, backfilling and compaction, cleaning, treating and testing, site restoration, and all other specified work not included in another bid item.

30. Water Main, 6-Inch-Diameter DIP

A. Measurement for payment of furnishing and installing ductile iron water distribution pipe will be included under the lump sum item stated in the Rate Proposal Form on a linear foot basis as determined by measurement along the centerline of the pipe in-place.

B. Payment will constitute full compensation for all work necessary for installation of ductile iron water distribution pipe, including but not limited to furnishing, transporting, storing, and installing the pipe, fittings, ground penetrating radar pipe location along the pipeline route, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, backfilling and compaction, cleaning, treating and testing, site restoration

and all other specified work

31. Cut & Plug Existing Water Main

A. Measurement for payment of cutting and plugging of existing water mains shall be included in the lump sum item in the Rate Proposal Form.

B. Cut and plug shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, bedding and bedding materials, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration (including the concrete cap, as required), and all work and materials necessary execute the Work.

32. Air Release Valve Assembly and Vault

A. Measurement for payment to furnish and install air release valve assembly and vault shall be included in the lump sum item in the Rate Proposal Form.

B. Air release valve assemblies shall include all sizes and types of air release valve assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, bedding and bedding materials, installation of the air release assembly, tapping saddle, isolation valve, reducers, piping, restraints, fittings, tracer wire, concrete manhole or vault, ring and cover, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration (including the concrete cap, as required), and all work and materials necessary to place the air release assembly into service.

33. Gate Valve, 6 inches, with box and pad

A. Measurement for payment to furnish and install 6-inch gate valves shall be included in the lump sum item in the Rate Proposal Form.

B. Each valve shall be furnished and installed, in accordance with the requirements of the Contract Documents. Payment will constitute full compensation for all work necessary to install the valves, including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

34. Gate Valve, 8 inches, with box and pad

A. Measurement for payment to furnish and install 8-inch gate valves shall be included in the lump sum item in the Rate Proposal Form

B. Each valve shall be furnished and installed, in accordance with the requirements of the Contract Documents. Payment will constitute full compensation for all work necessary to install the valves, including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

35. Valve Marker

A. Measurement for payment to furnish and install valve marker shall be included in the lump sum item in the Rate Proposal Form.

B. Each valve marker shall be furnished and installed, in accordance with the requirements of the Contract Documents. Payment will constitute full compensation

for all work necessary to install the valve markers, including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including all required materials and all other specified work to install the valve marker.

36. Tapping Sleeve & Valve Assembly, 6 inches x 6 inches

A. Measurement for payment to furnish and install tapping sleeves and valves shall be included in the lump sum item in the Rate Proposal Form. Tapping sleeves and valves shall be furnished, installed and tested, in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing tapping sleeves shall constitute full compensation for the complete installation of the tapping sleeve, valve and valve box. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

37. Tapping Sleeve & Valve Assembly, 8 inches x 6 inches

A. Measurement for payment to furnish and install tapping sleeves and valves shall be included in the lump sum item in the Rate Proposal Form. Tapping sleeves and valves shall be furnished, installed and tested, in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing tapping sleeves shall constitute full compensation for the complete installation of the tapping sleeve, valve and valve box. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

38. Tapping Sleeve & Valve Assembly, 8 inches x 8 inches

A. Measurement for payment to furnish and install tapping sleeves and valves shall be included in the lump sum item in the Rate Proposal Form. Tapping sleeves and valves shall be furnished, installed and tested, in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing tapping sleeves shall constitute full compensation for the complete installation of the tapping sleeve, valve and valve box. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

39. Tapping Sleeve & Valve Assembly, 16 inches x 8 inches

A. Measurement for payment to furnish and install tapping sleeves and valves shall be included in the lump sum item in the Rate Proposal Form. Tapping sleeves and valves shall be furnished, installed and tested, in accordance with the requirements

of the Contract Documents.

B. Payment for furnishing and installing tapping sleeves shall constitute full compensation for the complete installation of the tapping sleeve, valve and valve box. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

40. Fire Hydrant Assembly (without valve)

A. Measurement for payment for furnishing and installing fire hydrant assemblies shall be included in the lump sum item stated in the Rate Proposal Form and shall include but is not limited to transporting, storing, furnishing, and installation.

B. Payment for furnishing and installing fire hydrant assemblies shall be included in the lump sum item stated in the Rate Proposal Form and shall constitute full compensation for the construction of fire hydrant assemblies, complete, including fire hydrant, fire hydrant extensions, fire hydrant tee, required linear feet of 6-inch restrained joint ductile iron piping, concrete collars and thrust blocks, gravel pockets and all fittings. A backflow preventer may be required based on distance from the main line with approval from the County. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, treating and testing, cleanup, including valve box, extension, concrete collar, if required and all other specified work.

41. Salvage Existing Fire Hydrant

A. Removal of fire hydrant assemblies shall be included in the lump sum item stated in the Rate Proposal Form for each hydrant assembly removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing fire hydrant assembly, installation of required couplers, joints, caps, and plugs, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration (including the concrete cap, as required), storage and delivery of removed hydrants identified to be salvaged, and all work necessary to remove the hydrant.

42. ¾-inch Water Meter, Box, Customer Cut Off Valve and Box

A. Replace Water Meters and Box shall be paid for in the lump sum item stated in the Rate Proposal Form for each size water meter installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, bedding and bedding materials, installation of the meter, box and DWM required remote meter reader device, adjustment to final grade, fittings, protection of existing utilities, removal of old meter, abandonment of old meter box, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

43. 1-inch Water Meter, Box, Customer Cut Off Valve & Box

A. Replace Water Meters and Box shall be paid for in the lump sum item stated in the Rate Proposal Form for each size water meter installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring,

bedding and bedding materials, installation of the meter, box and DWM required remote meter reader device, adjustment to final grade, fittings, protection of existing utilities, removal of old meter, abandonment of old meter box, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

44. 1-½-inch Water Meter, Box, Customer Cut Off Valve & Box

A. Replace Water Meters and Box shall be paid for in the lump sum item stated in the Rate Proposal Form for each size water meter installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, bedding and bedding materials, installation of the meter, box and DWM required remote meter reader device, adjustment to final grade, fittings, protection of existing utilities, removal of old meter, abandonment of old meter box, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

45. 2-inch Water Meter, Box, Customer Cut Off Valve & Box

A. Replace Water Meters and Box shall be paid for in the lump sum item stated in the Rate Proposal Form for each size water meter installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, bedding and bedding materials, installation of the meter, box and DWM required remote meter reader device, adjustment to final grade, fittings, protection of existing utilities, removal of old meter, abandonment of old meter box, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

46. Water Service Line, ¾ inch

A. Measurement for payment for furnishing and installing water service line shall be included in the lump sum item stated in the Rate Proposal Form in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing water service lines shall constitute full compensation for the complete installation and testing of the water service from the water main to the meter stop in the meter box at the property line. Water services shall include all excavation and backfill, and fittings from the main to the upstream side of the meter including connection to the meter, all copper piping measured horizontally from the face of the meter box to the centerline of the main, casing measured horizontally, tracer wire, valves, corporation stop, saddle strap, meter stop, and all other fittings or items as required by the Contract Documents to provide a complete water service connection. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, testing, cleanup, site restoration, and all other specified work.

47. Water Service Line, 1 inch

A. Measurement for payment for furnishing and installing water service line shall be included in the lump sum item stated in the Rate Proposal Form in accordance with the requirements of the Contract Documents.
B. Payment for furnishing and installing water service lines shall constitute full compensation for the complete installation and testing of the water service from the water main to the meter stop in the meter box at the property line. Water services shall include all excavation and backfill, and fittings from the main to the upstream side of the meter including connection to the meter, all copper piping measured horizontally from the face of the meter box to the centerline of the main, casing measured horizontally, tracer wire, valves, corporation stop, saddle strap, meter stop, and all other fittings or items as required by the Contract Documents to provide a complete water service connection. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, testing, cleanup, site restoration, and all other specified work.

48. Water Service Line, 1 ½ inch

A. Measurement for payment for furnishing and installing water service line shall be included in the lump sum item stated in the Rate Proposal Form in accordance with the requirements of the Contract Documents.
B. Payment for furnishing and installing water service lines shall constitute full compensation for the complete installation and testing of the water service from the water main to the meter stop in the meter box at the property line. Water services shall include all excavation and backfill, and fittings from the main to the upstream side of the meter including connection to the meter, all copper piping measured horizontally from the face of the meter box to the centerline of the main, casing measured horizontally, tracer wire, valves, corporation stop, saddle strap, meter stop, and all other fittings or items as required by the Contract Documents to provide a complete water service connection. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleaning, testing, cleanup, site restoration, and all other specified work.

49. Water Service Line, 2 inch

A. Measurement for payment for furnishing and installing water service line shall be included in the lump sum item stated in the Rate Proposal Form in accordance with the requirements of the Contract Documents.
B. Payment for furnishing and installing water service lines shall constitute full compensation for the complete installation and testing of the water service from the water main to the meter stop in the meter box at the property line. Water services shall include all excavation and backfill, and fittings from the main to the upstream side of the meter including connection to the meter, all copper piping measured horizontally from the face of the meter box to the centerline of the main, casing measured horizontally, tracer wire, valves, corporation stop, saddle strap, meter stop, and all other fittings or items as required by the Contract Documents to provide a complete water service connection. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling

and compaction, cleaning, testing, cleanup, site restoration, and all other specified work.

50. Disposal of Water Main

A. Removal of water mains shall be included in the lump sum item stated in the Rate Proposal Form for each size and type of water main to be removed and shall cover the cost for all materials, transportation, labor, specially trained and equipped labor, equipment, excavation, sheeting and shoring, installation of required couplers, joints, caps, and plugs, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration (including the concrete cap, as required), and all work and materials necessary to locate, remove and dispose of the pipe and associated appurtenances. Unless indicated for removal in a separate Pay Item, appurtenances to be removed shall include but not be limited to fittings, isolation valves, air release valves, valve boxes, blow-offs, steel casings, casing spacers, fire hydrant assemblies, water service lines, water meter boxes, thrust blocks, and concrete. All such surplus items shall become the property of the Contractor unless specified to be salvaged by the Utility Owner. For asbestos concrete pipe, the lump sum item shall also include proper containment of contaminated or hazardous or potentially hazardous materials, proper labeling, any special fees associated with the removal, transport and disposal of the material, and all other costs required to excavate, remove, temporarily store, haul, and dispose the pipe sections.

51. Concrete Thrust Collar, 6-inch pipe or smaller

A. Concrete thrust collars shall be measured on an individual basis on the number of each size thrust collar acceptably installed.

B. Concrete thrust collars shall be paid for in the lump sum item stated in the Rate Proposal Form and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, reinforced concrete thrust collars, retainer glands, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration (including the concrete cap, as required), and all work and materials necessary to install a complete thrust collar. When Concrete Thrust Collar is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

52. Concrete Thrust Collar, 8-inch pipe

A. Concrete thrust collars shall be measured on an individual basis on the number of each size thrust collar acceptably installed.

B. Concrete thrust collars shall be paid for in the lump sum item stated in the Rate Proposal Form and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, reinforced concrete thrust collars, retainer glands, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration (including the concrete cap, as required), and all work and materials necessary to install a complete thrust collar. When Concrete Thrust Collar is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

53. Exploratory Excavations

A. Measurement will be made for each pre-approved test hole, measured as 144 square inches each, fully executed and restored. Written pre-approval by the Owner is required.

B. Payment shall be included in the lump sum item stated in the Rate Proposal Form

for each test hole executed as per this section. Payment is full compensation for all materials, labor, equipment, reports, research, temporary traffic control, permits, water, disposal of debris or unsuitable materials or liquids, cleanup, full restoration, and all other work incidental to the execution of the work.

54. Rock Excavation

A. Measurement for payment for rock excavation shall be included in the lump sum item stated in the Rate Proposal Form. Payment will constitute full compensation for all work necessary for rock excavation in accordance with the Plans and Specifications, including, but not limited to, labor, materials and equipment
    1. For pipeline excavation, the volume of rock excavation shall be calculated by multiplying the allowable trench width of outside pipe bell diameter plus 24 inches times the horizontal distance along the survey centerline times the average vertical height measured every 50 feet to 4 inches below the invert of the pipe.
    2. Rock shall be defined as any material that cannot be excavated with conventional excavating equipment and occupies an original volume of at least one cubic yard.
    3. For all other structures including manholes, maximum width shall be 24 inches beyond each edge of the completed structure. Depth for payment purposes shall be no deeper than 12 inches below the bottom of the manhole or structure.
    4. No payment will be made for rock excavation below the required grade or outside the width pay limits.
    5. Payment shall include the cost of removal and lawful disposal of the rock from the site. Backfill in place of the excavated rock is incidental and included in the payment of rock.
    6. Payment for rock excavation associated with micro-tunneling, directional drilling, jack and bore, tunnel construction and tunnel access shaft shall be considered incidental to the respective work.

55. Point Repairs

A. Measurement and payment for point repairs shall be included in the lump sum item stated in the Rate Proposal Form. This line item will be used for any repairs needed on conflicting utilities, drainage pipes, etc and will only be used as directed by the **County** or the **County's** Representative.

B. Payment will constitute full compensation for all work necessary for a complete repair including, but not limited to, labor, materials and supplies, and equipment required for the repair, groundwater control, site preparation, backfill, complete restoration, and cleanup

56. Insertion Valve – 6 inch

A. Measurement will be made for each valve inserted on an existing pressurized water main while maintaining constant pressure and service as usual

B. Insertion valves shall be paid for in the lump sum item stated in the Rate Proposal Form for each size valve inserted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the valve, valve boxes, fittings, restraints, concrete pad or collar, valve identification disc, valve marker, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the insertion valve and place it in service.

57. Insertion Valve – 8 inch

A. Measurement will be made for each valve inserted on an existing pressurized water main while maintaining constant pressure and service as usual
B. Insertion valves shall be paid for in the lump sum item stated in the Rate Proposal Form for each size valve inserted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the valve, valve boxes, fittings, restraints, concrete pad or collar, valve identification disc, valve marker, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the insertion valve and place it in service.

58. Insertion Valve – 16 inch

A. Measurement will be made for each valve inserted on an existing pressurized water main while maintaining constant pressure and service as usual
B. Insertion valves shall be paid for in the lump sum item stated in the Rate Proposal Form for each size valve inserted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the valve, valve boxes, fittings, restraints, concrete pad or collar, valve identification disc, valve marker, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the insertion valve and place it in service.

59. Remove Backflow Prevention Assembly

A. Removal of an existing backflow preventer shall be measured on an individual basis.
B. Removal of backflow prevention devices shall be paid for in the lump sum item stated in the Rate Proposal Form for each backflow preventer removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, bedding and bedding materials, removal of existing backflow preventer, removal of existing meter, removal of existing remote meter reader, installation of each at another location, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove and relocate the backflow prevention device.

60. Relocate Backflow Prevention Assembly

A. Relocation of an existing backflow preventer shall be measured on an individual basis.
B. Relocation of backflow prevention devices shall be paid for in the lump sum item stated in the Rate Proposal Form for each backflow preventer relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, bedding and bedding materials, removal of existing backflow preventer, removal of existing meter, removal of existing remote meter reader, installation of each at another location, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove and relocate the backflow prevention device. The service line from the main to the relocated backflow

preventer shall be paid for under a separate Pay Item.

61. Backflow Prevention Assembly

A. Backflow prevention devices shall be measured on an individual basis on the number of each size and type of backflow preventer acceptably installed. If the device is located in a vault, then the measurement shall include the vault and meter.

B. Back flow prevention devices shall be paid for in the lump sum item stated in the Rate Proposal Form for each type backflow preventer installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, bedding and bedding materials, installation of the backflow preventer, water meter, remote meter reader, concrete vault, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

62. Transfer Water Service

A. Measurement for payment for water service transfer shall be included in the lump sum item stated in the Rate Proposal Form for the actual number of water services transferred from an existing water main to a new, relocated water main.

B. Payment for water service transfer shall constitute full compensation for the complete transfer of the water service from the main to the meter; the meter shall not be relocated. This item shall include all fittings, piping, and restoration, to transfer the service, including pressure testing and disinfection, including connection to the meter. Work shall be performed by a licensed plumber. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, cleanup, and all other specified work.

63. Relocation of Existing Water Service

A. Measurement for payment for water service relocation shall be included in the lump sum item stated in the Rate Proposal Form.

B. Payment will constitute full compensation for all work necessary to relocate the service including relocation of the water meter and including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, placement and cleanup, required for the complete relocation of the water service from the main to the property line. The existing meter shall be reset as directed by the **County**. This item shall include all fittings, piping, and restoration, to relocate the service, including removal of the existing service, pressure testing and disinfection, including connection to the relocated meter. Work shall be performed by a licensed plumber. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, and all other specified work.

64. Relocation of Existing Fire Hydrant

A. Measurement for payment for fire hydrant relocation shall be included in the lump sum item stated in the Rate Proposal Form.

B. Payment will constitute full compensation for all work necessary to relocate the hydrant including, but not limited to, the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, placement and cleanup,

required for the complete relocation of the fire hydrant from one area of the project to another, as directed by DWM. This item shall include all fittings, piping, and restoration, to relocate the hydrant, pressure testing and disinfection, including connection to the relocated hydrant. Work shall be performed by a licensed plumber. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal and disposal of asphalt or concrete pavements and excavated material, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction, and all other specified work.

Part D: Other Direct and Indirect Costs- Temporary Facilities

65. Administrative

A. Measurement and payment for administrative costs shall be on lump sum basis.
B. Payment will constitute full compensation for all administrative costs required during the execution of the work.

66. Record Drawings

A. Measurement and payment for record drawings, O&M manuals and training shall be on a lump sum basis.
B. Payment will constitute full compensation for all work necessary to produce record drawings for the work installed.

67. Insurance (During Construction)

A. Measurement and payment for Insurance costs shall be on a lump sum basis.
B. Payment will constitute full compensation for all insurance required during construction.

68. Payment & Performance Bond (During Construction)

A. Measurement and payment for Payment and Performance Bond costs shall be on a lump sum basis.
B. Payment will constitute full compensation for all bonds required during construction.

69. Safety and Quality Control

A. Measurement and payment for Safety and Quality Control costs shall be on a lump sum basis.
B. Payment will constitute full compensation for all Safety and Quality Control costs required to meet all local, state, and federal safety requirements.

+++END OF SECTION 01200+++

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Preparing and processing of submittals for review and action
2. Preparing and processing of informational submittals

B. Submit the following for the **County's** review and action:
1. Shop drawings
2. Product data
3. Samples
4. Submittals indicated as "for approval"

C. Submit the following as informational submittals:
1. Structural design information required by the contract documents
2. Certificates
3. Coordination drawings
4. Reports
5. Qualification statements for manufacturers/installers
6. Submittals indicated as "for information only"

D. Specific submittals are described in individual sections.

E. Do not commence work that requires review of any submittals until receipt of returned submittals with an acceptable action.

F. Do not allow submittals without an acceptable action marking to be used for the project.

G. All submittals shall be submitted to the **County** by a flash or jump drive. Some submittals shall also be a hard copy; this will be determined by the **County**. One copy of each submittal shall be uploaded into the program named by the **County**.

1.02 DEFINITIONS

A. "Shop drawings" are drawings and other data prepared by the entity that is to do the work, specifically to show a portion of the work.

B. "Product data submittals" are standard printed data that show or otherwise describe a product or system, or some other portion of the work.

C. "Samples" are actual examples of the products or work to be installed.

D. “Informational Submittals” are those identified in the Contract Documents as for information only.

1.03 FORM OF SUBMITTALS

A. Sheets Larger than 8-1/2 by 14 Inches:
1. Maximum sheet size: 24 by 36 inches (except for full-size pattern or template drawings).
2. Number of copies:
   a. Submittals for review: three blue or blackline prints
   b. Informational submittals: three blue or blackline prints

B. Small Sheets or Pages:
1. Minimum sheet size: 8-1/2 by 11 inches
2. Maximum sheet size for opaque copies: 11 by 17 inches
3. Number of copies will be the same as for larger sheets

C. Samples:
1. Two sets of each shall be submitted with the original submittal.
2. One set will be returned.
3. If additional sets are needed by other entities involved in work represented by the samples, these shall be submitted with the original submittal.

1.04 COORDINATION OF SUBMITTALS

Submittals and activities that must be performed in sequence or of different types for the same product or system shall be coordinated so that the **County** has enough information to properly review each submittal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TIMING OF SUBMITTALS

A. Transmit each submittal at the time indicated on the approved construction schedule.

B. Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the **Contractor** in this respect will not be considered as grounds for an extension of the contract time.

C. Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type that cannot be prepared until after completion of the work; submit promptly.

D. If a submittal must be processed within a certain time in order to maintain the progress of the work, state so clearly on the submittal.

E. If a submittal must be delayed for coordination with other submittals not yet submitted, the **County** may, at its option, either return the submittal with no action, or notify the **Contractor** of the other submittals that must be received before the submittal can be reviewed.

3.02 SUBMITTAL PROCEDURES - GENERAL

A. Contractor Review: Sign each copy of each submittal certifying compliance with the requirements of the contract documents.

B. Notify the **County**, in writing and at time of submittal, of all points upon which the submittal does not conform to the requirements of the contract documents, if any.

C. Preparation of Submittals:

1. Label each copy of each submittal, with the following information:
    a. Project name
    b. Date of submittal
    c. Contractor's name and address
    d. Supplier's name and address
    e. Manufacturer's name
    f. Specification section where the submittal is specified
    g. Numbers of applicable drawings and details
    h. Other necessary identifying information
2. Submittals to receive **County's** action marking: Provide blank space on the label or on the submittal itself for action marking; minimum 4 inches wide by 5 inches high.

D. Transmittal of Submittals:

1. Submittals will be accepted from the **Contractor** only.
2. Submittals received without a transmittal form will be returned without review or action.
3. Transmittal form: Use a form acceptable to the **County**; provide space on form for:
    a. Project name
    b. Submittal date
    c. Transmittal number
    d. Specification section number
    e. To:
    f. From:
    g. Contractor's name
    h. Subcontractor's and supplier's names
    i. Manufacturer's name
    j. Submittal type (shop drawing, product data, sample, informational submittal)
    k. Description of submittal
    l. Action marking
    m. Comments
4. Fill out a separate transmittal form for each submittal; also include the following:
    a. Other relevant information
    b. Requests for additional information

3.03 SHOP DRAWINGS

A. Content: Include the following information:

1. Dimensions, at accurate scale
2. All field measurements that have been taken, at accurate scale

3. Names of specific products and materials used
4. Details, identified by contract document sheet and detail numbers
5. Show compliance with the specific standards referenced
6. Coordination requirements; show relationship to adjacent or critical work
7. Name of preparing firm
8. Design Calculations

B. Preparation:

1. Reproductions of contract documents are not acceptable as shop drawings.
2. Copies of standard printed documents are not acceptable as shop drawings.
3. All submittals shall be identified as indicated.
4. Space for **County's** markings shall be adjacent to the title block.

3.04 PRODUCT DATA

A. Submit all product data submittals for each system or unit of work as one submittal.

B. When product data submittals are prepared specifically for this project (in the absence of standard printed information), submit such information as shop drawings and not as product data submittals.

C. Content:

1. Submit manufacturer's standard printed data sheets.
2. Identify the particular product being submitted; submit only pertinent pages.
3. Show compliance with properties specified.
4. Identify which options and accessories are applicable.
5. Include recommendations for application and use.
6. Show compliance with the specific standards referenced.
7. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
8. Identify dimensions that have been verified by field measurement.
9. Show special coordination requirements for the product.

3.05 SAMPLES

A. Samples:

1. Provide samples that are the same as proposed product.
2. Where selection is required, provide a full set of all options.

B. Preparation:

1. Attach a description to each sample.
2. Attach name of manufacturer or source to each sample.
3. Where compliance with specified properties is required, attach documentation showing compliance.
4. Where there are limitations in availability, delivery, or other similar characteristics, attach description of such limitations.
5. Where selection is required, the first submittal may be a single set of all options; after return of submittal with selection indicated, submit a standard number of sets of the selected item.

C. Keep final sample set(s) at the project site, available for use during progress of the work.

3.06 REVIEW OF SUBMITTALS

A. Submittals for approval will be reviewed, marked with appropriate action, and returned. Submittals are reviewed for conformance with project design concept and for compliance with standard of quality established in the Contract Documents. This review shall not relieve the **Contractor** from responsibilities for correctness of detail and dimension, nor from deviation from Contract Document requirements, except as noted and accepted in writing by the **County** at the time of submittal.

B. Informational submittals: Submittals will be reviewed.

C. Action markings for submittals for approval will be as follows:

1. NO EXCEPTIONS TAKEN and EXCEPTIONS TAKEN AS NOTED: Indicate that the submitted item is released for manufacture with consideration given to any comments noted.
2. REVISE AND RESUBMIT: Indicates that the submittal will be revised or a new submittal prepared, complying with the comments made.
3. REJECTED: Indicates that the submitted item does not comply with contract requirements and that another selection must be made and the submittal process repeated.

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

A. Submittals will be returned to the **Contractor** by mail.

B. Perform resubmittals in the same manner as original submittals; indicate all changes other than those requested by the **County**.

1. Exception: Transmittal number for resubmittal shall be the number of the original submittal plus a letter suffix.
2. Resubmittals shall be submitted within 14 days of **Contractor's** receipt of rejected submittal.

C. Distribution:

1. Make one copy for project record documents.

+++ END OF SECTION 01300 +++

SECTION 01310
CONSTRUCTION SCHEDULE

PART 1 – GENERAL

1.01 SCOPE

A. Timely performance is of the essence on this Project. The **Contractor** may complete the Project or any part of the Project earlier than is stipulated in the Contract and the Milestone requirements. The **Contractor** may schedule its work to complete earlier than required by the Contract or stipulated in the approved schedule; however, under no circumstances shall the **Contractor** be entitled to added compensation for delays that occur during the originally stipulated contract period.

B. The **County** has purchased the entire scheduled time period by virtue of this Contract and further stipulates that only those delays that meet the tests set forth in GR-6 of the General Requirements will be considered for adjustment and only to the extent that they delay the work past the originally contractually stipulated milestones.

1.02 PROCEDURES

A. The Work under this Contract shall be planned, scheduled, executed, reported, and accomplished using the Precedence Diagramming Critical Path Method (hereinafter referred to as CPM). The work required by this section includes the requirement to prepare, maintain, and update all detailed schedules as described in this section. The CPM Schedules shall be prepared in such a manner as to permit the orderly planning, organization, and execution of the Work and be sufficiently detailed to accurately depict all the Work required by the Contract. The **Contractor** shall resource (labor, material, and equipment) and cost load its Schedule as specified herein.

B. **Contractor** hereby agrees that in the process of preparing its baseline schedule and monthly updates, it will consult with all key Subcontractors and suppliers to assure concurrence with the feasibility and achievability of the **Contractor's** planned start dates, sequencing, durations, and completion dates. A copy of the computer input files, in PRX or XER format, shall be submitted on a flash drive containing fully detailed logs with each submittal. The procedures, technical details, and **Contractor's** participation and responsibilities shall be as hereinafter described.

C. **Contractor** is responsible for determining the sequence of activities, the time estimates for the detailed construction activities and the means, methods, techniques and procedures to be employed. The Schedules identified herein shall represent the **Contractor's** best judgment of how it will prosecute the Work in compliance with the Contract requirements. **Contractor** shall ensure that the Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions may require and as required by the Contract Documents.

F. **Contractor's** construction schedule shall be prepared using the latest version of Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM) Release 8. Any and all costs incurred by the **Contractor** in researching, training, and/or educating its personnel in CPM and/or Oracle Primavera P6 (or the utilization of outside consultants) shall be part of the **Contractor's** bid price and not reimbursed separately by the **County**.

1. The Project Network Schedule Diagram, mathematical analysis, written narrative, and monthly updates will be reviewed by the **County**. Items will be reviewed for compliance with these Specifications and accurate reporting by the **Contractor** of work in place, resource loading and work activity durations.

2. The **Contractor** shall submit to the **County** an accepted final CPM Construction Schedule and Final Schedule of Values including Allowance Items, allocated to the CPM Schedule activities within 45 days of the Notice to Proceed. Requirements for the final CPM Construction and Final Schedule of Values are further described hereinafter. **Contractor's** Application for Payment will not be approved until the final CPM Schedule and Schedule of Values have been accepted. The Contract Baseline Schedule submittal shall not show any progress until it is accepted by the **County.**

1.03 STANDARDS

A. Definition: CPM, as required by this Section, shall comply with the standards outlined in the Associated General Contractors' publication, "Construction Planning and Scheduling" unless specifically changed by this Section.

B. CPM Construction Schedule: The **Contractor's** CPM Construction Schedule shall include a graphic time scaled logic network, computerized tabular reports and resource loading as described below. To be acceptable, the schedule must demonstrate the following:

1. A logical succession of Work from start to finish. This logical succession, when accepted, is the **Contractor's** work plan and, contrary to normal CPM standards, is designated as early start/early finish solely to accommodate the Primavera software.

2. Clear definition of each activity including cost, manpower, equipment and material quantities as resources. The assigned dollar value (cost loading) of each activity shall cumulatively equal the contract price.

3. Proper interfacing of related activities including submittals, major material and equipment deliveries, procurement, required permits and other constraints such as equipment or manpower/crew availability. Submittal dates must include review periods and permit schedules must include agency review and issue dates. The narrative shall explain the rationale for all constraints, lags, and unusual relationships.

4. Agreement with the interim milestones, schedule coordination requirements, and completion dates indicated in the Contract Documents.

C. CPM Graphic Logic Network

1. The CPM graphic logic network or diagram shall be in the form of a time-scaled diagram of the customary precedence diagram and may be divided into a number of separate pages with suitable notation relating the interface points among the pages. Individual pages shall not exceed 34 inches by 44 inches. Notation on each activity line shall include activity descriptions, total float, and durations as a minimum.

2. All construction activities and procurement shall be indicated in a time-scaled format, and a calendar shall be shown on all sheets along the entire sheet length. Each activity shall be plotted so the beginning and completion dates of said activity can be determined

graphically by comparison with the calendar scale. A legend shall be included clearly distinguishing between critical and non-critical path activities and progress to date.

D. Duration: The duration indicated for each activity shall be in units of whole working days and shall represent the single best time considering the scope of the Work and resources planned for the activity including time for holidays and inclement weather. The calendar for the network shall be in calendar days. Except for certain non-labor activities, such as submittal preparation and review, curing concrete, delivering and fabrication of materials, or other activities described specifically in the Contract, activity durations shall not exceed 14 Days, be less than one Day, nor exceed $50,000 in value unless otherwise accepted by the County.

E. The Interim Schedule and Contract Baseline Schedule shall show dependencies (or relationships) between each activity. Each activity must have a successor and predecessor, except for the Project Start and Finish Milestone. The use of date constraints shall be limited to Contract Milestones and Contract Completion dates only, unless approved by the **County**.

F. Contract Baseline Schedule shall contain or be able to demonstrate that the following items have been addressed:

1. the Project's name;
2. the **Contractor's** name;
3. revision or edition number;
4. activities of completed work,
5. activities relating to different areas of responsibility, such as subcontracted Work which is distinctly separated from that being done by the **Contractor** directly;
6. labor resources distinguished by craft or crew requirements;
7. equipment and material resources distinguished by equipment and material requirements;
8. distinct and identifiable subdivisions of work such as cleaning, pre-liner installation inspection, CIPP installation;
9. locations of work within the contract limit lines that necessitates different times or crews to perform;
10. outage schedules for existing utility services that will be interrupted during the performance of the Work;
11. Phases; and
12. Interim Milestones and the Contract Completion dates.

G. Computerized Tabular Reports: Reports shall include the following for each activity depicted in the schedule.

1. Activity ID
2. Activity Description
3. Duration (original and remaining)
4. Early Start Date
5. Early Finish Date
6. Total Float
7. Percent Complete
8. Activity Cost and Resources
9. Actual Start Date
10. Actual Finish Date

H. Project Information: Each report shall be prefaced by the following summary data.

1. Project Name
2. Contractor
3. Type of Tabulation (Initial or Updated)
4. Project Duration
5. Project Scheduled Completion Date
6. Projected Completion Date

1.04 ACCEPTANCE

A. The finalized CPM Construction Schedule will be acceptable to the **County** when it provides an orderly progression of the Work from Notice to Proceed to Final Completion in accordance with the Contract requirements, adequately defines the **Contractor's** Work plan, provides a workable arrangement for processing submittals in accordance with the requirements, and properly allocates resource values for manpower, major materials, equipment and costs to each activity (free of unbalances in resources) as determined by the **County**. Manpower may be represented as composite crews in the CPM Construction Schedule. The network diagram and tabular reports, when accepted by the **County,** shall constitute the CPM Construction Schedule until revised and re-accepted.

B. When the CPM Construction Schedule has been accepted, the **Contractor** shall submit to the **County**:

1. Three (3) copies of the CPM graphic logic network
2. Three (3) copies of a computerized, tabular report in which activities have been sequenced by early starting date
3. Two (2) copies of the schedule on a flash drive
4. Three (3) copies of the narrative

C. The **County's** review and acceptance of the **Contractor's** CPM Construction Schedule is for conformance to the requirements of the Contract Documents only. Review and acceptance by the **County** of the **Contractor's** CPM Construction Schedule does not relieve the **Contractor** of any of its responsibility whatsoever for the accuracy or feasibility of the CPM Construction Schedule, or of the **Contractor's** ability to meet interim milestone dates and the Contract completion date, nor does such review and acceptance expressly or impliedly warrant, acknowledge, or admit the reasonableness of the logic, durations, and resource value loading of the **Contractor's** CPM Construction Schedule.

D. The **Contractor** shall participate in a conference with the **County** to review the **County's** comments on the schedule and evaluation of the proposed network diagram, mathematical analysis and monetary value of activities. The intent is to achieve a clearer understanding of the CPM and reach consensus on any revisions to be made. Any revisions necessary as a result of this review shall be resubmitted to the **County** within 10 calendar days after the conference. The accepted schedule shall then be used by the **Contractor** for planning, organizing, and directing the work, and for reporting progress. If the **Contractor** desires to make changes in its method of performing the Work, it shall notify the **County** in writing, stating the reason for the changes. The **Contractor** shall receive written acceptance of the change prior to putting the change into the accepted schedule.

1.05 QUALIFICATIONS

A. The **Contractor** shall demonstrate competence in the use of CPM scheduling through the submission of a fully compliant CPM Construction Schedule with the initial CPM submission. In the event the **Contractor** fails to so demonstrate competence in the CPM scheduling, the **County** may direct the **Contractor** to employ the services of a Scheduling Firm that can demonstrate competence. If such a directive is issued, the **Contractor** shall comply.

B. The **Contractor** shall use the services of scheduler with verifiable training and credentials in preparing and maintaining a computerized CPM Construction Schedule using Primavera software, as specified herein. The scheduler must qualify within the planning period.

1. Required Experience: Performed CPM scheduling on at least two completed construction projects of value at least 75 percent as large as this one and having at least 75 percent as many schedule items as this one. Scheduling of both projects shall have been done using the latest version of Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM) Release 8 or equal.

2. Submit the following:

    a. Descriptions of at least two projects of the value and complexity above.
    b. Copy of a CPM schedule from one of the previous projects.
    c. Names and telephone numbers of facility **County** representative, design engineer, and construction manager for each project.
    d. Evidence supporting the above qualifications.

1.06 SUBMITTAL REQUIREMENTS

A. Initial submittal, revisions, and monthly updates of the network diagram, mathematical analysis, and written narrative shall be submitted in three hard copies and two data copies on a flash drive. Submittals will not be accepted unless they are complete as described herein.

B. The **Contractor** shall submit the following:

1. A CPM time scaled logic network, computer generated using the latest version of Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM) Release 8.

2. Computerized Tabular Reports:

    a. Activity sort by early start, organized by facility or area
    b. Predecessor/successor listing
    c. Activity code dictionary
    d. Resource code dictionary

3. Basis of schedule narrative describing the logic and reasoning of the schedule. The narrative shall summarize the overall approach to construction sequencing, including but not limited to: 1) anticipated lost days due to weather, 2) the rationale for all constraints, lags and unusual relationships, 3) the definition of labor and crews, 4) a list and durations for all major pieces of equipment and resources, and 5) work proposed to be performed on any other than a single-shift, five-day workweek basis

4. Resource value allocation by activity.

5. Breakdown of specific cost amount for each component of multi-component activities in the CPM Schedule in spreadsheet format (using Microsoft Excel) showing component unit quantities as well as costs. Such breakdown, when accepted by the **County,** shall constitute the Schedule of Values for the Project.

6. Flash drive copy of the entire schedule, narrative, and spreadsheet.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE ORIENTATION SESSION

A. Contractor shall, upon notification from the **County**, attend a Schedule Orientation Session relating to the Schedules and Reports requirements for this Contract. The Schedule Orientation Session is designed to review in detail, the objectives of the Schedules and Reports requirements and the requirements. The **Contractor** shall arrange for its Project Manager, Superintendent, and Scheduler to attend the Schedule Orientation Session.

B. The following items shall be discussed during the Schedule Orientation Session: 1) the procedures and requirements for the preparation of the Contract Baseline Schedule, and monthly updates by the **Contractor**, 2) how the requirements of the Contract Documents will be monitored and enforced by the **County**, 3) how long-lead items and time requirements for the Work by Subcontractors will be identified and included in the Contract Baseline Schedule, 4) testing and startup, 5) coding and logic for the Contract Baseline Schedule, and 6) identification and scheduling of shop drawings and other submittals.

3.02 SCHEDULE OF VALUES

A. Submittals

1. **Contractor** shall allocate a dollar value for each activity on the Contract Baseline Schedule. The dollar value for the activity shall be the cost of the Work including labor, materials and equipment. Allowances shall be loaded on activities specifically included for this purpose. No activity on the Contract Baseline Schedule shall exceed a value of $50,000, unless approved by the **County**. The sum of all activity costs shall equal the Contract Price. Contractor shall revise the resource and value loading as necessary to gain the acceptance of the **County.**

2. The Final Schedule of Values shall incorporate all comments associated with the **Contractor's** Schedule/Schedule of Values submittals.

3. Submit documentation to support the values with data, which will substantiate their correctness, as requested by the **County**.

4. The Schedule of Values, when accepted by the **County**, shall be used as the only basis for the **Contractor's** Applications for Payment. The total price paid for mobilization shall

be as approved by the **County**, but in no case shall it exceed four percent (4%) of the total Part I and Part 2 bid amount.

5. The Schedule of Values shall be derived from the assigned Progress Schedule Activity Values and identified by Activity ID.

B. Form and Content of Schedule of Values

1. Identify the Schedule of Values submittal with:

   a. Title of Contract and location
   b. Contract Number
   c. Name and address of **Contractor**
   d. Date of submission

2. The **Contractor's** Schedule of Values shall list the installed value of the component parts of the Work in sufficient detail to serve as the basis for computing values for progress payments during construction.

3. Identify accounts with the location code and area code as defined in the Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM) Release 8 format and list the number and title of the respective major Section of the Specifications.

4. All accounts in the Schedule of Values shall be derived from the activities in the Progress Schedule. Account data pertaining to the Schedule of Values shall, at a minimum, include the following for each Account:

   a. CPM Activity number
   b. **County's** Standard Code listed on the Bid Schedule
   c. Account representative quantities (linear feet of CIPP, linear feet of cleaning, tons of debris, etc.), unit costs, person-hours, item, and account dollar value
   d. WBS code (as used by Primavera Project Planner scheduling software), including location, responsibility and area codes
   e. Specification Section Numbe
   f. Account Type: Lump Sum (LS), Unit Price (UP), Allowance (AL), or Change Order (CO)

C. Unit Price Accounts (UP): Payment for Unit Price Accounts shall be based upon actual quantities of Work performed in compliance with the Contract Documents, as verified and accepted by the **County**. Whenever the actual quantity differs from the estimated quantity on the Unit Price Accounts, the **Contractor** shall notify the **County** in writing. Quantity over and under runs will be tracked on the Schedule of Values.

D. Allowance Accounts (AL): Payment for Allowance Accounts will be based upon invoices submitted by the Contractor subject to conditions and limitations of the Contract Documents. Refer to Section 01200, Measurement and Payment, for requirements. The Allowance shall be adjusted to the actual amount paid for such services, and adjusted by Change Order either at the end of that phase of the Work or at the completion of the Work. The **County** will have sole discretion on determining when to make adjustments to the Allowance.

E. A new account will be added to the Schedule of Values for approved Change Order work. Payment for Time and Expense Change Order work (CO) shall be based upon the General and Supplementary Conditions of these Specifications.

F. The sum of all Account Values listed in the Schedule of Values shall equal the total Contract Price, excluding Allowance Items.

3.03 MONTHLY APPLICATION FOR PAYMENT

A. Monthly Application for Payment: **Contractor** shall provide monthly Schedule Update, monthly Payment Report and monthly Narrative Report as its monthly Application for Payment package.

B. Monthly Schedule Update: The **Contractor** shall submit, at intervals of 30 calendar days, an update of all activities in the as-planned CPM schedule. The update shall be created by updating the mathematical analysis and the corresponding computerized network diagram of the Schedule.

1. The schedule shall be updated by entering the following: Actual start and completion dates of completed activities and the actual start date and remaining duration of activities in progress.

2. The updated network diagram shall be submitted in the same format as noted in Specification Section 1.02, Procedures, with the calendar starting from the date of the update.

3. The updated mathematical analysis shall be submitted in the same format noted in Specification Section 1.02, Procedures.

4. The schedule update shall include an update of the cash flow projections in the same format as the original approved submittal.

5. The schedule update will state the percentage of the work actually completed and scheduled as of the report date.

C. The Monthly Payment Report shall show the activities or portions of activities completed during the reporting period, their total monetary values and the monetary values earned as a basis for the **Contractor's** Application for Payment. A mutually agreed upon percent complete will be assigned to each completed and partially completed activity to be used for calculating the monetary value earned to date. For activities underway, the percent complete shall not be related to the remaining duration.

D. A monthly narrative report shall be submitted including, but not limited to the following:

1. Description of work accomplished.

2. Summary of safety and quality issues occurring during the month and corrective actions taken.

3. Contractor evaluation of actual progress versus progress planned.

4. Progress along all paths with negative float, along with the reasons for the delay, if the project is behind schedule.

5. A description of all revisions made to the schedule, including: all added, deleted, and revised activities that have been accepted by the **County**; all logic revisions; and all duration revisions.

6. A description of the problem areas, current and anticipated delaying factors and their impact, and an explanation of corrective actions taken or proposed.

E. If the **Contractor** fails to submit any of the required components of the Application for Payment, the **County** will withhold approval of the Application for Payment until such time as the **Contractor** submits the required components.

3.04 PROGRESS MEETINGS AND LOOK-AHEAD SCHEDULES

A. For the weekly progress meetings, the **Contractor** shall submit a Look-Ahead Schedule. This schedule will cover four weeks: the immediate past week, the current week, and the forthcoming two weeks. This schedule will include all activities that are complete, started, incomplete, underway, or scheduled to be worked during this four-week time frame. This schedule shall list all activities from the accepted CPM Construction Schedule that are complete, are scheduled for Work during the period, are currently planned to be worked, even if out of sequence, and Work that is unfinished, but scheduled to be finished. Actual start and completion dates shall be provided for the Work that has been completed the prior week; forecast start and finish dates shall be provided for the Work that is in-process or upcoming.

B. Each activity noted above shall be identified by activity number corresponding to the accepted CPM Construction Schedule and detailed description of the activity.

C. The Look-Ahead Schedule shall be delivered to the **County** twenty-four (24) hours prior to the weekly progress meeting.

D. The Look-Ahead Schedule shall be in a format approved by the **County**.

E. Tabular reports for manpower and equipment resources shall be provided for each Look-Ahead Schedule.

3.05 CPM CONSTRUCTION SCHEDULE REVISIONS

A. The **County** may direct and, if so directed, the **Contractor** shall propose, revisions to the CPM Construction Schedule upon occurrence of any of the following instances:

1. The actual physical progress of the Work falls more than five percent (5%) behind the accepted CPM Construction Schedule, as demonstrated by comparison to the accepted monthly CPM Construction Schedule updates or as determined by the **County** if a current accepted CPM Construction Schedule does not exist.

2. The considers milestone or completion dates to be in jeopardy because of “activities behind schedule.” “Activities behind schedule” are those that have not or cannot be started or completed by the dates shown in the CPM Construction Schedule, regardless of the existence of positive float on the activity.

3. A Change Order has been issued that changes, adds, or deletes scheduled activities or affects the time for completion of scheduled activities.

B. When the instances requiring revision to the CPM Construction Schedule occur, the **Contractor** shall submit the proposed revised CPM Construction Schedule within ten (10) working days after receiving direction from the **County** to provide such Schedule. No additional payment will be made to the **Contractor** for preparation and submittal of proposed revised CPM Construction Schedules. However, if the **County** accepts the proposed revised CPM Construction Schedule, it shall replace and supersede all previous CPM Construction Schedules and substitute for the next monthly CPM Construction Schedule update that would otherwise be required.

C. Revisions to the CPM Construction Schedule shall comply with all of the same requirements applicable to the original schedule.

3.06 SCHEDULE RECOVERY

A. If a revised CPM Construction Schedule accepted by the **County** requires the **Contractor** to employ additional manpower, equipment, hours of work or work shifts, or to accelerate procurement of materials or equipment, or any combination thereof, as schedule recovery measures to meet Contract milestones, the **Contractor** shall implement such schedule recovery measures without additional charge to the **County**.

B. Furthermore, if efforts to recover are not deemed effective, as determined by the **County**, or if prior to submittal of the recovery schedule, the **County** determines that critical milestones are in jeopardy, the **County** may direct the **Contractor** to implement the above or any other recovery efforts at no additional costs to the **County**.

3.07 TIME IMPACT ANALYSIS REQUIREMENT

A. When delays are experienced by the **Contractor** and a time extension is requested, the **Contractor** shall submit to the **County** a written Time Impact Analysis illustrating the influence of all changes or all delays on the current Project completion date. The time impact analysis shall be constructed on an As-Built Schedule Analysis approach. The As-Built Schedule that is created will incorporate all actual start and finish dates, actual durations of activities, actual sequences of construction (referred to as the As-Built Logic) current as of the time the Time Impact Analysis is performed. This Time Impact Analysis shall incorporate all delays (including **County**, Contractor and third party delays without exception) in the time frame that they actually occurred with actual logic ties. The As-Built Schedule data shall be obtained from the most recent approved monthly schedule update. The As-Built Schedule shall be created as an early start schedule with the actual start and finish dates coinciding with the early start and finish dates from the most recent approved monthly schedule update. The As-Built Schedule shall show the original activity durations equal to the actual duration and the actual logic driving all activities. The **County** will validate this As-Built Schedule. All requests for time extension shall be based upon an analysis of this As-Built Schedule. The critical path will be established and all **County**-caused delays on the critical path will be identified. The time extension will be based solely upon the cumulative duration of all **County** and third party-caused delays that are on the

critical path. Any time extensions to the project's Interim Milestone Dates, if any, shall be non-compensable time extensions only.

B. Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest approved update of the project schedule, in effect at the time the change or delay was encountered.

+++ END OF SECTION 01310 +++

SECTION 01350
PROJECT DOCUMENT TRACKING AND CONTROL SYSTEM

1.01 SCOPE

A. The **Contractor** shall utilize the **County's** Project Document Tracking and Control System (DTCS). The primary function of the system is to facilitate timely processing and approval of all contract documentation in coordination with the overall Project Schedule established by these Specifications and the **Contractor**. This system will utilize Sharepoint (or the **County's** latest DTCS) for document tracking and control and Lynx Photo Management software. The Contract Manager software will:

1. Facilitate communication among the **County** and **Contractor**.

2. Facilitate turn-around time with regard to responses and approvals.

3. Provide a central location for all Project information to facilitate all Project participants in performing their tasks based on the latest Project data.

4. Provide a standard system of project administration with accountability.

B. The **Contractor** shall utilize the web-based DTCS system that resides on the Department of Watershed Management server to generate documents in the proper format for submission to the **County**. The **Contractor** shall access the system through the internet using a compatible web browser from the **Contractor's** administrative field office location, and/or other locations where work associated with the Project is being performed.

C. The **Contractor** shall generate Project documents and records utilizing the aforementioned system. The **Contractor** shall transmit and submit the Project documents within the system to the **County**.

D. The **Contractor** shall utilize a high-capacity scanner capable of scanning 11 x 17 documents, double-sided, on site for the entire duration of the Project. All documents must be scanned in and attached to the appropriate Contract Manager document, including submittals, shop drawings, O&M manuals, and all other documents requested by the **County**.

E. The **Contractor** shall utilize the DTCS to create and maintain Project documents, including, but not limited to the following:

1. Company Directory: Addresses, Phone Numbers, Personnel Contacts, etc.
2. Drawings Log: Current Drawing revision log
3. Submittals (Integrated with Project Schedule through Activity codes)
4. Transmittals
5. Requests for Information and Answers (RFIs)
6. Change Documents, Including:
   a. Requests for Proposal (RFPs)
   b. Work Authorizations (WAs)
   c. Change Order Requests (CORs)
   d. Change Orders (CO)
7. Daily Reports (Daily Diaries)

8. Field Decisions & Clarification Memos
9. Notice of Non-Compliance
10. Construction Issue Memos
11. Punch lists
12. Meeting Minutes & Agendas
13. Correspondence
14. Work Plans
15. Start-up Plans
16. Equipment O&M Training
17. Spare Parts

F. The **Contractor** shall utilize the complete capabilities of the DTCS to meet the requirements of this Section. The **Contractor** shall provide a highly trained and experienced construction project controls person knowledgeable in construction work sequencing, productivity, scheduling and application of the Primavera Contract Manager software system. This person, along with the **Contractor's** management team, shall work closely with the **County** to deliver the documents outlined in this Section.

G. Software Support

1. The **Contractor** shall maintain an internet connection using DSL or better to connect to the DTCS to allow the forwarding and receipt of documents.
   a. The Contract Manager software supports the Microsoft Outlook email program, and the **Contractor** shall utilize Microsoft Outlook.
   b. The Contractor shall also provide 2 days of consulting services in the base bid for troubleshooting and maintenance of the DTCS at any location designated by the **County** or at the **Contractor's** administrative field office (if authorized by the **County**). Troubleshooting, maintenance, upgrade, configuration, and setup shall be performed by Evans Technology or their authorized representative based on a scope pre-defined by the **County**. The **Contractor** shall utilize the custom data fields, dictionaries, and coding systems as required by the **County**.

H. The **Contractor** shall attend a 2-day training session on the operation of the **County's** DTCS, provided by an Authorized Trainer. The **Contractor** shall provide the training session for ten participants (fee for the Primavera Authorized Trainer). The training session shall be held at the Evans Technology, facility in Roswell, Georgia, and shall be attended by up to three participants from the **Contractor**'s team, as well as representatives of the **County** (seven participants). The **Contractor** shall be responsible for the cost of training for additional members of its firm or future retraining, as may be deemed necessary by the **Contractor**.

I. The **Contractor** shall meet with the **County** within 15 days after the Contract is awarded to discuss access requirements and the **Contractor's** plan to utilize DTCS and execute the document control functions herein.

J. Access through the internet to the DTCS shall be operational within 30 days following the pre-construction meeting date. This must be operational from the **Contractor's** administrative field office location.

1.02 COMPANY DIRECTORY

A. The **Contractor** and the **County** will monitor and manage the Company Directory. The directory must include Company name, Company abbreviation, contact names, address, phone numbers, and e-mail addresses.

1.03 DRAWING LOG

A. The **County** will maintain a log of initial "issued for construction" drawings in the DTCS. Information shall include drawing number, title and revision number. In addition to logging the initial project drawing list, the **County** will maintain a log on the DTCS of all subsequent revisions to these drawings and any sketches resulting from clarification memos, RFIs, field orders and Change Orders. The **Contractor's** shall utilize the latest drawings and sketches in the performance of the work.

1.04 SUBMITTALS/SHOP DRAWINGS

A. Requirements: This section specifies supplemental requirements to GR-24 and Section 01300, Submittals, related to the processing of submittals and shop drawings. The **Contractor** shall utilize the DTCS to log and track submittals, as well as generate associated transmittal letters.

B. Submittals and Product Data: The **Contractor** shall enter into the DTCS a list of all required submittals. Submittals shall be incorporated into packages, with numbering as follows: XXXXX-YYY, where X denotes the applicable specification section; Y denotes the individual submittal number for that particular specification section, beginning with 001. The **Contractor** will log and track all submittals utilizing the DTCS. Each review cycle shall be entered into the DTCS. The **Contractor** shall identify as activities in the CPM schedule, specified in SC-16, to include all data submittals, as well as those involving complex reviews and long lead deliveries, and all procurement items required for construction activities. Submittal schedule information shall be updated monthly with the **Contractor's** updated project CPM schedule, as specified in SC-16.

C. Samples: A list of all required sample submittals will be entered into the DTCS by the **Contractor**. Sample submittals shall be identified as individual submittals within the submittal packages with numbering as specified above.

D. Guarantees/Warranties: A list of all required Guarantee/Warranty submittals shall be entered into the DTCS by the **Contractor**. These submittals shall be identified as individual submittals within the submittal packages, with numbering as specified above.

E. Work Plans, Start-up Plans, O&M Submittals and Spare Parts: All testing, Start-up and O&M submittals will be entered into the DTCS by the **Contractor**. These submittals shall be identified as individual submittals within the submittal packages identified with numbering as specified above.

F. Submittal Procedures: The **Contractor** shall prepare all submittal packages utilizing the submittal numbering system, description, and packaging conventions described above. Submittals prepared by the **Contractor** that fail to follow the conventions described above, will be returned and labeled "amend and resubmit." Should the **Contractor** determine that a submittal is required and is not covered by the listing within the DTCS, consultation will be required with the **County** to determine the submittal number,

description, and packaging.

1.05 CORRESPONDENCE

A. The **County** shall monitor and manage the correspondence, Non-Compliance Notices, Field Decisions, Clarification Memos, and Construction Issue Memo logs. The **Contractor** shall be responsible for generating Project correspondence within the DTCS, and forwarding the correspondence to the **County**.

1.06 TRANSMITTAL LOG

A. Both the **Contractor** and the **County** will monitor and manage the transmittal log. All Project transmittals shall be created electronically, automatically sequentially numbered and logged into the DTCS system as they are created. The **Contractor** shall be responsible for utilizing the system to create transmittals for items transmitted to the Owner, County, Resident Inspection Staff, and other Contractors.

1.07 REQUEST FOR INFORMATION & ANSWERS

A. The **Contractor** shall be responsible for generating RFIs on the DTCS system. The **Contractor** shall notify the **County** when an RFI is submitted. The **County** will monitor and manage the RFI log. The **County** will generate an Answer document in response to each RFI and forward it to the **Contractor**. The DTCS will track "Ball in Court" for all RFIs and Answers, as well as date of original generation and response date. In addition, the RFIs shall reference the relative Specification Section and Drawings. The DTCS will identify the date of the request and the originator, responsible party for a response and the date of the response.

1.08 CHANGE DOCUMENTS

A. Change documents include Request for Proposals (RFPs), Work Authorization Requests (WARs), Work Authorizations (WAs), Change Orders Requests (CORs), and Change Orders (COs). All change documents will be monitored and managed by the **County** utilizing the DTCS. The DTCS will track "Ball in Court" status of all change documents.

1.09 DAILY REPORTS

A. The **Contractor** is responsible for creating daily reports (daily diaries) utilizing the DTCS. The **Contractor** is required to enter the Daily Reports into the DTCS by 10:00 a.m. of the subsequent day that the **Contractor** or any subcontractor performs work. All daily reports shall be logged into the DTCS by the **Contractor**. The **Contractor** shall also provide one signed hard copy of all daily reports on a weekly basis. Required information shall include **Contractor**, Date, Day, Temperature, Precipitation, Sky, Wind, Work Activity, Equipment, Field Force, Visitors, Materials, and Scheduled Activities, utilizing the Primavera schedule activity codes. Daily reports that fail to link work activities to the active Project schedule will not be acceptable.

1.10 PUNCHLISTS

A. The **County** will monitor and manage punch lists, and will create punch lists to be forwarded to the **Contractor**. The **Contractor** shall address the punch list items that have

been assigned to the **Contractor** and forward updates to the **County**. Once accepted as complete, the **County** will access the punch list in the DTCS and close it out.

1.11 MEETING MINUTES AND AGENDA

A. The **County** shall monitor and manage the meeting minute process. The **County** will forward meeting minutes to the **Contractor** electronically. The **County** will log the meeting minute items into the DTCS within 3 days of the meeting date.

1.12 PROGRESS PAYMENTS /REQUISITIONS FOR PAYMENT

A. The **Contractor** is responsible for creating progress payment applications directly from the project scheduling software and then forwarding them to the **County** electronically along with hard copies by 4:00 p.m. at the end of each update/billing period. The **Contractor** shall also simultaneously provide a separate submittal of the updated progress schedule (P5 or latest version at the time of purchase), as specified in Section 01310. All Progress Payments and schedule of values shall be developed as defined in Section 01310 within the Pay Application shall be coordinated with the **County's** Project Manager. Maintenance of the "As Built" record documents by the **Contractor** shall be verified before processing will be approved. Failure of a **Contractor** to maintain project record documents, maintain current and properly prepared daily reports, or to submit the project schedule update per Section 01310, will be just cause for withholding of the monthly or final payment.

1.13 LYNX PHOTO MANAGEMENT SOFTWARE

A. The Lynx PM software shall be utilized by the **County** and the **Contractor** for the duration of the project. The daily construction photographs will be the permanent visual record of the pre-construction conditions, daily construction site activities, and the completion of construction work. The **Contractor** must submit to the **County** no less than four record photos for each activity ID listed in the project schedule per the last schedule update. Applicable photos must accompany each Pay Application.

+++ END OF SECTION 01350 +++

SECTION 01351
PUBLIC OUTREACH

PART 1-GENERAL

1.01 SCOPE

A. The **Contractor** shall provide all personnel, services and materials as specified under this necessary to meet the requirements and responsibilities related to the Public Outreach Office, public relations and the Outreach Team Leader (OTL), as specified hereinafter, during performance of Work under the Agreement by the **Contractor**.

1.02 STAFFING

A. The **Contractor** shall employ a full-time OTL who meets the required minimum qualifications and experience below. The sole and specific duties and job of the OTL shall be to perform Customer Service-related functions and to continuously coordinate and provide information and services as required to the **County**'s Construction Manager, Public Outreach staff, and others as necessary.

1. The OTL must have been employed on at least two satisfactorily completed water line construction projects.

2. The OTL must have had responsibility for receiving, logging, tracking, responding, and resolving customer/citizen complaints and claims, providing notices to and personal interaction with affected customers/citizens regarding project impact and projected work schedules of the **Contractor**, and reviewing project schedules and "look-ahead" to determine projected areas of impact from the Work.

3. The OTL must have a minimum of 2 years of experience in performing this type of work on similar projects.

4. The OTL shall attend a 4-hour mandatory Public Outreach training session presented by the DeKalb County Department of Watershed Management Public Outreach Office.

5. The OTL will manage a team of two persons, employed by the **Contractor**, to quickly resolve incidental complaints on site during the project.

PART 2-PRODUCTS (NOT USED)

PART 3-EXECUTION

3.01 PUBLIC INFORMATION KICK-OFF MEETING

A. Prior to commencement of Work under the Contract and following the Preconstruction Meeting, the **Contractor**, the OTL, and the **County** will be required to attend a public information meeting hosted by the Public Outreach

Office. At this meeting the **Contractor**'s responsibilities and the relationship with the Public Outreach Office and the functions and responsibilities of the OTL employed by the **Contractor** as required under Section 1.02 A, above will be discussed. The **Contractor**'s OTL and backup individual shall be identified to the DWM's Call Center and the Public Outreach Office with 24/7 contact telephone numbers provided.

3.02 RESPONSIBILITIES OF THE OTL

A. The duties of the **Contractor**'s OTL shall be as defined below and may be expanded by the **County**'s Construction Manager as needed. Responsibilities of the **Contractor**'s OTL shall include, but not be limited to, the following elements.

1. Receiving, logging, tracking, and resolving customer/citizen complaints and Claims, either received directly, by the **County** or its authorized representative, and providing periodic updates and reports as specified.

2. Providing notice to affected customers/citizens in the event there are scheduled service outages or other work elements required for the performance of Work under the Agreement that are scheduled which will have an impact on the neighborhood or property owners.

3. Attending and participating in scheduled project progress meetings for discussion, updates, and resolution to customer/citizen complaints, claims, review of schedules, and other matters, as required.

4. Attending and participating in periodic public meetings. Working with the Public Outreach Office to prepare necessary information in advance of these meetings.

In the event Work is required on private property where an easement has been acquired, the OTL shall notify the property owner at least 14 days in advance of commencement of the Work in writing, a copy of which must be provided to the Public Outreach Office.

Prior to commencement of work in any neighborhood, the OTL shall provide notice to the Public Outreach Office and at the Public Outreach Office's direction and with its coordination, notify the customers/citizens 30 days in advance. In addition, 24 hours prior to actual commencement of the work, the OTL shall notify the customers/citizens via door or mailbox hanger as hereinafter provided for in this Section. All such notices shall be coordinated with the **County**'s Construction Manager and Public Outreach Office.

The OTL will be responsible for managing those notifications within the context of the Project Schedule and the approved project procedures. The OTL will assist the **County** site staff with the resolution of any public outreach-related items that might delay or disrupt the project work.

The OTL shall be on 24-hour call, 7 days a week and be equipped with a mobile phone. In the event the OTL is away from work, the **Contractor** shall designate a second individual to handle the responsibilities and functions who shall be fully familiar and aware of the duties and prosecution of the Work.

The **Contractor**/OTL shall report and log in all complaints to the Public Outreach Office Call Center within 6 hours of receipt. Conversely, all calls received by the Help Line will be transmitted to the OTL within 24 to 48 hours of receipt and the OTL must perform follow-up within 24 hours with resolution after receipt of the notice. Upon receipt of the information, the Call Center will create a file to document the incident.

The **Contractor**'s OTL shall maintain a Project Complaint Log fully detailing all customer/citizen complaints/claims, questions, and resolutions. All complaints/inquiries received in the field by the work crew regarding the project must be documented by the OTL and entered into the Project Log, even if resolved immediately. This Complaint Log will be available to the **County**'s Construction Manager and the Public Outreach Office in its updated state for review or reference when needed. The Log shall be submitted on a monthly basis with the progress payment request.

Where property owners make damage claims, the OTL shall coordinate the activities of the **Contractor**'s, Subcontractor's, or Vendor's insurance provider(s) during the investigation and repair process and obtain the complainant's signoff to conclude and close the file. The **County** shall be informed in writing upon resolution of any complaint by the **Contractor** or its designated representative and copied on the sign-off documents. The OTL shall track any and all insurance damage claims, payments, settlements, etc., on the Project, whether they are the responsibility of the **Contractor** or subcontractors, or are disputed. This Damage Claim Log shall be separate from the Complaint Log, but may be cross-referenced if the damage results in a complaint.

The OTL shall assist the **Contractor**'s Traffic Control Officer in coordination of all street closures, detours, and traffic pattern changes with the **Contractor**'s field management staff, the **County**'s Construction Manager, Public Outreach Office, and the Department of Public Works or the GADOT. The OTL will check the notice status with the **Contractor**'s Traffic Control Officer each morning and confirm that notifications to the **County**'s Traffic Control center are current and accurate for Police, Fire, and Emergency vehicle access. The OTL will also assist in the coordination on the signal changes involved with temporary traffic plans.

As required, the OTL must provide notice to the affected areas in advance of the scheduled closures, detours and traffic pattern changes. This includes, but is not limited to, maintaining safe residential and business access, mail delivery, and garbage pick-up, providing temporary and /or alternate services and relocation coordination for school bus, MARTA stops, and any other temporary facilities needed to keep neighborhood safety, security and services within acceptable limits. All these items and their coordination will be required as part of the detailed work plans, site-specific safety plans, traffic management plans, erosion and sedimentation plans, and project schedules.

In the event there is an emergency involving the public or a situation where media inquiries and responses are possible, the **County**'s Public Outreach Office shall be notified immediately. The Public Outreach Office will then coordinate with the **County**'s Media Relations Manager for appropriate action. **Under no circumstance shall the OTL, any employee, Subcontractor, or Vendor of the Contractor make any comments to the media regarding the project at any time.**

The OTL shall be responsible for holding media relations training and management with the on-site staff. Procedures shall be developed within the site-specific safety plan to establish guidelines for managing any media response to an emergency issue. The entire site staff shall be trained on them.

3.03 ISSUES MANAGEMENT TRACKING

A The **Contractor** shall employ an organized and comprehensive issues management strategy for tracking customer/citizen complaints, claims, and inquiries, including, but not limited to the use of Customer Service Tracking Software. Should the **Contractor** choose to use tracking software, usage licenses should be purchased for both the **Contractor** and the **County**, All related information shall be updated on a daily basis by the OTL. Tracking information and responses shall be coordinated with the Public Outreach Team. Additionally the **Contractor** shall purchase Technical Support and Maintenance services until final completion of the project plus 6 months or until all claims on the project are resolved. Reports shall be provided as weekly updates on all activities and on specific cases within 24 hours when requested.

B Information recorded shall include but not be limited to the following:

1. Date complaint/claim/inquiry received
2. Name, address and telephone number of individual filing complaint/claim/inquiry
3. Nature of complaint/claim/inquiry
4. Address where problem is located if different than above
5. Action required, date, action taken, date action completed
6. Follow-up with person who filed under number 2 above to verify satisfaction or status
7. Documents associated with actions taken
8. Any information regarding resolution with the **Contractor**'s, Subcontractor's, or Vendor's Insurance Company shall be fully documented

3.04 IDENTIFICATION BADGES AND SECURITY

A. All members of the **Contractor**'s staff and its subcontractors' permanent staff at or above the level of foreman who will be working on-site will be issued an ID badge by the **County**. The ID badge will list the worker's name and company Affiliation and will include a picture.

B. A template will be provided by the Public Outreach Team and shall be returned to the Public Outreach Team when updated with the above information..

C It shall be the **Contractor**'s responsibility to collect the ID badge from any employee who is discharged or resigns prior to completion of the project as well as at completion of the project. The **Contractor** shall return all ID badges to the Public Outreach Team within 48 hours of their collection. The **Contractor** will be charged a fee of $25.00 per badge for any badge not returned at completion of the project. For any ID badges lost during the term of the project that must be reissued, there will be a charge of $15.00 per ID badge. The **Contractor** shall deduct these charges from its periodic or closeout payment request or the **County** will deduct them.

D Because lower level personnel of the **Contractor**, Subcontractor, or Vendor will not be issued ID badges, the **Contractor** must maintain a daily sign-in sheet for daily workers under its supervision. The Superintendent must be able to identify any employee on the site as a bona fide worker if asked and if not able to identify, the **County** will direct the Superintendent to remove the individual from the site. The **Contractor** and Subs or Vendors will provide a program of temporary ID badges and/or laminated on-site passes that must be cross-referenced to each day's employee time card/payroll sheet with unique employees' numbers. Any employee that will be on the Project over 30 days will be issued a picture ID with the employee number prominently shown. Any employee possessing an ID badge must wear that badge visibly at all times on the Project. The **Contractor** is responsible for maintaining a safe "drug-free" work environment.

E The **Contractor** shall develop a Security Plan for use on the job site during construction. The Plan shall encompass as a minimum such topics as the use of pre-employment background checks for specific project staff, drug tests, crime prevention and anti-theft procedures, workplace violence and methods to secure project documents. All staff working on the site shall be familiar with the requirements of the Security Plan.

F **County** Ordinances prohibit the carrying of weapons on **County** streets. The **County** Police Department will be notified of any person bringing weapons to the jobsite; they will be removed immediately and prosecuted.

G All of the **Contractor**'s staff at or above the level of foreman shall attend a 4-hour mandatory Safety Training session conducted by DeKalb County Department of Watershed Management safety inspectors. Multiple training sessions will be offered and staff must complete the training at least within 1 month of commencing work on the jobsite. All costs associated with the training will be considered as incidental to the Contract.

H Persons on the jobsite shall report any suspicious activity by workers or by others at the jobsite area first to the Project Management, and/or DeKalb County Police and/or Fire Department by calling 911 and immediately to the Engineering and Construction Management Service Division Head.

3.05 DOOR-HANGERS

A. The **Contractor** shall produce door hangers required for notice to customers/citizens and residents from the template provided by the **County**'s Public Outreach Team (SEE EXAMPLE AT END OF SECTION) as specified above in paragraph 3.02. Door hangers shall be utilized for notification in the event of, but not limited to, the following events:

1. Planned service disruption/outages
2. Road closures/detours/traffic pattern changes
3. Access/entrance to property
4. Work start-up
5. Smoke testing
6. Blasting

3.06 IMPACTED AREA ADDRESS DATABASE

A. The **Contractor** shall provide the Public Outreach Office with a database of addresses and phone numbers (and names if available) of all project impacted residences, businesses and facilities at least 3 weeks prior to project start-up. The database will be used by the Public Outreach Team for regular citizen communications and notifications.

B. The **Contractor** and **County** shall copy the **County**'s Public Outreach Team on all correspondence and Right of Entry Agreements with citizens and property owners.

3.07 SCHEDULE

A. The **Contractor** shall provide the Public Outreach Team with a copy of the detailed project schedule following approval by the **County**.

B. Bi-weekly, the **Contractor** shall provide a list of properties:

1. That will be affected by the **Contractor**'s activities within the upcoming 4 weeks.
2. Where work is ongoing in the right of way in front or in the back of the property.
3. Where site restoration activities are ongoing.

C. The **Contractor** shall inform the **County**'s Public Outreach Team through the weekly progress meetings and in writing of any project schedule changes or changes in "disruptive work" such as blasting, road closures, etc., that would have significant impact on citizens or require prior citizen notification. The OTL shall notify the Public Outreach Team of any "disruptive" activities affecting the public that occur on the jobsite within 4 hours of their occurrence.

3.08 MEDIA RELATIONS AND JOB SITE INQUIRIES

A. As specified above in paragraph 3.01, only authorized persons shall release any information to media inquiries. The **Contractor**'s field personnel shall at all times have project information cards available that will be provided to media and citizens if inquiries are made on-site. All inquiries shall be directed to the person referred to on the card and citizens shall be referred to the Project Information Line.

B. Project information cards shall be produced by the **Contractor** from the template provided by the Public Outreach Team. A sample information card is provided at the end of this Section. Final language to be included on the Project Information Card will be provided at the Public Outreach Kick-off Meeting. (SEE EXAMPLE AT END OF SECTION)

3.09 VEHICLE SIGNS AND PROJECT SITE SIGNAGE

A. The **Contractor** shall place pre-approved magnetic signs on all job-site project vehicles. The signage template will be approved by the **County** Communications Office with the signs to be produced by the **Contractor**.

B All project sites shall have pre-approved project signs which read in accordance with the Template provided by the Public Outreach Office. Signs shall be produced by the **Contractor**. Some of the signs shall be mounted on moveable skids so they can be relocated as the project progresses on various streets in the project area. Sizes will vary, but all will be smaller than the 96"x 48" size project signs shown. Size shall be as directed by the **County**.

3.10 NOTIFICATIONS

The **Contractor** shall provide the following notifications to the Public Outreach Team to facilitate its communication with affected citizens through automated phone message or mailers:

A. Anticipated work start date-must at least 3 weeks prior to start of construction so that Public Outreach Team can send out mailer 2 weeks prior and complete distribution notification letter 48 to 72 hours before construction begins.

B. Service disruptions-notify Public Outreach Team at least 72 hours in advance so that a 48-hour notice automated phone message notice may be issued.

C. Street Closure or Partial Closure-notify Public Outreach Team at least 72 hours in advance to permit 48-hour automated phone messaging.

D. Significant work in a neighborhood, such as blasting, directional drilling, trenchless installation, open cut, etc., shall require notification of the Public Outreach Team at least 72 hours in advance to permit 48-hour automated phone messaging.

E. The **Contractor** shall provide the following door hanger notifications and the manpower to deliver them at a minimum:

1. Service disruptions: notice to citizens 48 hours prior to disruption.

2. Street Closure or Partial Closure: notify fire, police, other emergency services, and other authorities 48 hours prior to street closure.

3. Significant work in neighborhood, such as blasting, directional drilling, trenchless installation, open cut, etc.: notify citizens via door hangers 48 hours in advance.

F. The **Contractor** shall be fully responsible for notification to all emergency related services for detours, closures (partial or full) or traffic pattern changes and as such they must be detailed in their traffic control plan and implemented through the **Contractor**'s Traffic Control Manager and per all permitting requirements.

G. The **Contractor** shall be fully responsible for distributing all notifications a minimum of 48 hours in advance of service outages for schools, nursing homes, hospitals, medical clinics, assisted living facilities or other types of facilities. **Contractor** shall also make personal contact with facility representatives no later than 60 minutes prior to the outage.

H. The **Contractor** shall at all times coordinate with the Public Outreach Team and Call Center to provide detailed schedules and street locations for service disruptions or street closures to ensure that DWM Customer Service Call Center is well equipped to provide adequate response to citizen inquiries.

3.11 RESOLUTION OF COMPLAINTS AND CLAIMS

A. Failure of the **Contractor** to resolve any legitimate complaint or claim filed resulting from the work performed under this contract, following notice in accordance with the General Requirements, may result in resolution of the complaint or claim by the **County**. The **Contractor** will be charged for the associated cost in accordance with the applicable General Requirements of the contract. No additional payment will be made to the **Contractor** for any costs associated with complaint or claim resolution, same being incidental to the various contract items which are bid. Failure to manage the issues and items adequately to minimize public complaints and impacts will be cause for increasing the retainage, withholding payment and/or Notice and Termination of the **Contractor** for cause if more than 10% of the noticed complaints or claims past 30 days are without decisive resolution and scheduling of recovery work.

+++ END OF SECTION 01351 +++

SECTION 01380
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

The **Contractor** shall clearly document site conditions prior to the start and upon the completion of the project/contract by use of digital video recording (DVR). The cost of all photographic documentation shall be included in the Contract Price.

1.02 PROCEDURES

A. The DVRs and periodic still photographs shall be taken from identifiable reference points along the work corridor. The same reference points shall be used through the life of the project/contract to achieve an accurate record of construction.

B. The **Contractor** shall ensure that any areas of sensitivity, such as landscaped areas, lake, or stream banks, or areas surrounding existing structures, are adequately documented.

C. Each photograph, video, or digital file of such submitted will be dated, identified, and captioned, referencing the location, project name, project number, and any pertinent information to clearly describe the scene.

1.03 VIDEOS

A. The project corridor shall be documented by DVRs .

B. All DVRs shall be in color and shot with a 1080 HD camera, resulting in a clear, stable image with no interference. Black and white recordings will not be accepted. The video shall be provided on Digital Video Discs (DVDs) or flash drives and shall conform to currently recognized standards for video recordings. Specifically, all recordings shall be in focus and properly illuminated with good contrast. The picture must be clear and possess accurate color levels and balance (tint) without outside interference. All recordings shall also include a clear and distortion-free audio narration that clearly identifies all important features of the project and is in synchronization with the video. The recording shall bear a continuous "date and time stamp" that is electronically recorded by the camera.

1.04 SUBMITTALS

A. The **Contractor** shall furnish to the **County** for approval one copy of the video digital file taken of existing conditions prior to start of the project and before the submittal of the first request for payment. The video digital file taken upon completion of the project and shall be furnished to the **County** for approval prior to submittal of the final request for payment. Neither pay requests shall be processed before the submittal of the respective video records.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01380

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SCOPE

A. Testing shall be performed to determine that materials provided for the Work meet the specified requirements, in accordance with the requirements of the Specifications. Such testing includes, but is not necessarily limited to:

1. Cement
2. Aggregate
3. Concrete
4. Concrete block
5. Pipe
6. Steel and metals
7. Welding
8. Soil compaction
9. Bituminous pavement

B. Requirements for testing may be described in various sections of these Specifications; where no testing requirements are describe, but the **County** decides that testing is required to demonstrate compliance with specified material or performance standards, the **County** may require testing to be performed under current pertinent standards for testing.

C. Employment of a testing laboratory shall in no way relieve the **Contractor** of its obligation to perform work meeting the requirements of the Contract.

D. The independent testing laboratory shall be selected and paid by the **Contractor** and approved in writing by the **County** before any testing services are performed.

E. The **Contractor** shall pay directly for the services of the independent testing laboratory, approved by the **County**, for all testing required under this Contract.

1.02 LABORATORY DUTIES

A. Cooperate with **County** and **Contractor**.

B. Provide qualified personnel promptly on notice.

C. Perform specified inspections, sampling and testing of materials and methods of construction.

1. Comply with specified standards, ASTM, other recognized authorities and as specified.

2. Ascertain compliance with requirements of Contract Documents.

D. Promptly notify **County** and **Contractor** of irregularity or deficiency of work that are observed during performance of services.

E. Promptly submit three (3) copies (two copies to the **County** and one copy to the **Contractor**) of the report of inspections and tests in addition to those additional copies required by the **Contractor**. The report shall include:

1. Date issued
2. Project title and number
3. Testing laboratory name and address
4. Name and signature of inspector
5. Date of inspection or sampling
6. Record of temperature and weather
7. Date of test
8. Identification of product and Specification section
9. Location of Project and test
10. Type of inspection or test
11. Results of test
12. Observations regarding compliance with Contract Documents

F. Perform additional services as required.

G. Laboratory is not authorized to:

1. Release, revoke, alter, or enlarge requirements of Contract Documents.
2. Approve or accept any portion of Work.

1.03 CONTRACTOR RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work and/or manufacturer's requirements. **Contractor** shall not charge for down time due to required testing.

B. Provide to laboratory, preliminary representative samples, in required quantities, of materials to be tested.

C. Furnish copies of mill test reports.

D. Furnish required labor and facilities to:

1. Provide access to Work to be tested

2. Obtain and handle samples at the site

3. Facilitate inspections and tests

4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.

E. Notify laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.

F. Laboratory Tests: Where such inspections and testing are to be conducted by an independent laboratory or agency, the sample or samples shall be selected by such laboratory or agency or by the **County** and shipped to the laboratory by the **Contractor** at **Contractor**'s expense.

G. Copies of all correspondence between the **Contractor** and testing agencies shall be provided to the **County**.

1.04 QUALITY ASSURANCE

Testing, when required, shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.05 PRODUCT HANDLING

Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting or replacement of materials with the least possible delay in progress of the Work.

1.06 FURNISHING MATERIALS

The **Contractor** shall be responsible for furnishing all materials necessary for testing.

1.07 CODE COMPLIANCE TESTING

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the **Contractor**, unless otherwise provided in the Contract Documents.

1.08 CONTRACTOR'S CONVENIENCE TESTING

Inspection or testing performed exclusively for the **Contractor**'s convenience shall be the sole responsibility of the **Contractor**.

1.09 SCHEDULES FOR TESTING

A. Establishing Schedule

1. The **Contractor** shall, by advance discussion with the testing laboratory, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.

2. Provide all required time within the construction schedule.

B. When changes in the construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory, as required.

1.10 TEST AND CERTIFICATIONS

A. General: As a minimum, the following tests shall be performed and the following certifications provided:

1. Cement: Certified test results by cement manufacturer or by independent laboratory shall be furnished as required by the **County**.

2. Aggregate and Mortar Sand: Certified test results by aggregate producer or by independent laboratory shall be furnished as required by the **County**.

3. Concrete

   a. At least five (5) standard 6-inch cylinders shall be taken each day for each 100 cubic yards or fraction thereof for each class of concrete used.
   b. The number of cylinders, the point of sampling, and the method of securing the samples shall be determined by the **County**.
   c. All samples shall be taken to the testing laboratory for laboratory curing.
   d. Two (2) of the laboratory cured samples shall be tested at 7 days, two (2) samples tested at 28 days, and one (1) sample shall be held in reserve.
   e. Test all concrete in accordance with ASTM C31-69, C39-71 and C-172.
   f. Slump Tests
      (1) Perform slump tests on the job in accordance with ASTM standards.
      (2) One (1) slump test shall be performed for each 25 cubic yards of concrete.
      (3) More slump tests shall be performed if deemed necessary by the **County**.
   g. Perform air entrainment tests in accordance with the following standards:
      (1) Field tests - ASTM C 173
      (2) Laboratory tests - ASTM C 231

B. Precast and Concrete Block for Buildings

1. Block and precast may be visually inspected on the site by the **County**.

2. The **County** reserves the right to have the concrete block tested by an independent laboratory.

C. Steel and Miscellaneous Metal: Reinforcing steel, structural steel and miscellaneous metal may be inspected visually on the site by the **County**.

D. Welding: 1 percent minimum of all structural welds during construction shall be inspected either visually or by an independent laboratory as required by the **County**.

E. Compaction of Earthwork

1. The compaction shall be tested by the **County** or by an independent laboratory.

2. The testing shall be performed in a manner in accordance with these Specifications.

F. Bituminous Concrete: The material testing for the bituminous concrete shall be performed by an independent laboratory as deemed necessary by the **County**.

1.11 TAKING SPECIMENS

Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the **County**.

1.12 TRANSPORTING SAMPLES

The **Contractor** shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

+++ END OF SECTION 01410 +++

SECTION 01500
TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SCOPE

A. The **Contractor** shall provide all temporary facilities necessary for the proper completion of the Work, as necessary and as specified

B. The **Contractor** shall maintain temporary facilities in proper and safe condition through the progress of the Work. In the event of loss or damage, the **Contractor** shall immediately make all repairs and replacements necessary subject to approval of the **County** and at no additional cost to **County**. At completion of the Work , the **Contractor** shall remove all such temporary facilities or as directed by the **County**.

C. The ownership of the trailers for **County**'s facilities shall remain with the **Contractor**. However, all the office furnishings and equipment provided by the **Contractor** under this section of specifications shall remain **County** properties. At completion of the Work, all of the office furnishings and equipment shall be moved by the **Contractor** to a location designated by the **County**.

1.02 REQUIREMENTS

A. General

1. The materials, equipment, and furnishings provided under this Section shall be new, and shall meet all the applicable codes and regulations.

2. The **Contractor** shall make all provisions, and pay all costs of furnishing, installation, maintenance, professional services, permit fees, and site work for the temporary facilities.

B. Construction

1. Temporary buildings shall be structurally sound and weather-tight, with floors raised above ground. All mobile/modular buildings shall comply with GA-DCA/SBCC/ADA requirements, and shall be Williams-Scottsman or approved equal.

2. Temporary buildings shall have temperature transmission resistance compatible with occupancy and storage requirements.

1.03 CONTRACTOR'S FACILITIES

A. Submit a plan of the facilities layout to **County** for approval within 15 days of the Notice to Proceed. **Contractor's** plant, for purposes of this Section, is defined to include, but not limited, to its field offices, first aid station, storage facilities, and major equipment. Sufficient facilities shall be provided and maintained at all points where work is in progress to adequately meet the demands of the Work and with ample margin for emergencies or overload.

The location of stationary and mobile equipment shall be subject to the **County**'s approval.

B. First Aid Stations: **Contractor** shall provide a suitable first aid station equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. **Contractor** shall have standing arrangements for the removal and hospital treatment of any injured person. The information reflecting this arrangement shall be clearly posted for easy visibility. All first aid facilities and emergency ambulance service shall be made available by **Contractor** to **County** and **County's** personnel.

1.04 COUNTY'S FACILITIES

A. **County**'s Project Office

1. Within 60 days after receipt of the Notice to Proceed, the **Contractor** shall furnish all materials and equipment and construct, paint, furnish, and maintain the **County's** project office, which shall meet the contract minimum square feet of finished floor space and shall be 8 feet high, with a full height partition dividing the office into rooms, as approved by the **County**. The partition walls shall be lined with vinyl- covered sheetrock and sound-deadening materials. The floor space shall be partitioned to provide for offices, a plan room, a copy room, a conference room, break area with kitchen facilities, including hot and cold running water in a double stainless steel sink, men's and women's rest rooms with exhaust fans, each with a wash basin with hot and cold running water, and a change room with two shower stalls, a wash basin, and a separate 40-gallon hot water heater. Contract Drawings shall show the office and site location and layout.

2. The actual layout and dimensions for the rooms shall be shown on the contract drawings. Additional entities, such as closets, built-in cabinets, and shelving will be determined by the **County** through the shop drawing approval process. The offices shall be provided with approximately 150 feet of two-tier hung shelving and 150 feet of lower cabinets, 30 inches in width and surfaced with wood-grained laminate counter top. Each office shall include two, 2-drawer, letter-sized file cabinets, used as a vertical support to the laminated counter top. The two-tier shelving shall be constructed of 1x12 white pine, faced with 1x2 and 1x3 facing stained to match the paneling, and finished with two coats of polyurethane satin varnish. The shelving shall be designed to support a full load of manuals, books, etc. without sagging. All interior floors shall be covered with indoor/outdoor carpeting, except the rest rooms, main entry, and the kitchen area, which shall be composition vinyl.

3. The **County's** project office shall be a pre-fabricated building or a double-wide mobile office having ceiling, floor, and walls adequately insulated. This facility shall be erected on top of a minimum 6-inch 4,000-PSI reinforced concrete slab, over a 6-inch layer of crushed stone, minimum 95% compaction with subgrade minimum of 95% compaction. The facility shall be tied down to meet code requirements. The complex shall have a minimum of five exterior steel doors, each equipped with a double deadbolt with a pull handle exterior and closer. All partition and closet doors shall be furnished with integral locks. The main entry shall have a covered porch at least 12 feet by 34 feet and approach steps and railing built with pressure-treated wood.

The main entry shall have an ADA compliant access. The other entrance(s) shall have a covered porch at least 4 feet square with appropriate steps and railing. The office facility shall be properly skirted using perforated fiberglass skirting material designed to match the exterior of the structure. The office shall also be constructed with additional supports below the floor space occupied by the fireproof filing cabinets to meet the maximum dead and live loads. The office shall be secured with tie-downs for minimum 100-mile-per-hour gusts and winds.

4. The office shall have a minimum of 18 vertical sliding windows of 46 inches x 27 inches to allow adequate sunlight and ventilation. The windows shall be properly weatherproofed, equipped with insulated glass, screening, exterior steel reinforced bugler bars, and Levelor blinds. Lighting fixtures with diffuser covers, in adequate numbers, shall be installed to give minimum illumination of 150-foot candles and minimum glare. Exterior flood lights shall be provided at each exterior entry. 110-volt duplex outlets, two above and one below the lower cabinet counter top on each wall in each office shall be provided. The office building shall be adequately wired for electricity in accordance with applicable codes to handle the total lighting, air conditioning, and other loads. The building shall be equipped with air conditioning and heating combination unit(s) to maintain 78 degrees F inside in winter with outside air temperature of 20 degrees F and 72 degrees F inside in summer with outside temperature of 100 degrees F. The HVAC units shall be located at the kitchen/break room end of the facility equipped with an overhead plenum wall return air wall system.

5. The **Contractor** shall furnish the services of a professional computer system installer to install, connect, and test the various computers, printers, communication equipment, and other peripherals specified by contract. The project office and equipment layout shall be a complete installation with wall outlets and shall be a satisfactorily functioning system.

6. The **Contractor** shall provide furnishings, fixtures, and equipment, as stated in the contract and approved by the **County**

1.05 TELEPHONE SERVICES

A. General

1. Make all necessary arrangements for outside telephone service to **Contractor's** office, **County's** Project Office(s), and the First Aid Station. The connection to **County's** Facilities shall be consistent with the specified hardware requirements for such facilities. Schematic drawings, showing the complete telephone system to be installed, shall be provided for review by the **County** before installation of the service. All portions of the communication system shall be maintained in good working condition.

2. All expenditures for installation costs of hardware, lines, line extensions, service changes, and recurring service charges for telephone service shall be paid by the **Contractor**. The **County** will reimburse the **Contractor** for long distance charges made by the **County**.

3. The telephone system to be installed and maintained for the **County's**

Facilities shall meet minimum requirements within the contract. The **Contractor** shall provide the **County's** Project Office with five separate, auto rollover numbers, with intercom, paging, voice mail, conference calling, speaker phone, redial and speed dialing, call and message waiting signals, volume control, outgoing call restriction, night service, and flexible function keys. The **County's** Project Office shall be provided with phones for each office including the conference and kitchen. The intercom and paging shall extend to the **County's** Site Office located adjacent to the **County's** Project Office.

4. The Contractor shall furnish two additional dedicated telephone lines to the **County's** Project Office. One will be used for a dedicated facsimile machine. The second line will be used for dedicated computer communications with the **County's** networked mainframe computer, which shall meet the contract minimum requirement.

1.06 PARKING FACILITIES

A. General

1. Provide ample parking, paved, adjacent to **Count**y's Project Office(s), without necessitating jockeying of cars, for a minimum parking spaces one per office plus two at the **County's** Project Office. Minimum handicapped parking places at the County office shall be marked. The parking surfaces shall be promptly and adequately maintained by the **Contractor** for the duration of the Contract.

2. The parking facilities will be limited to the contract limits shown on the plans. The storage and work facilities provided by the **County** shall not be used for parking by the **Contractor** or its personnel. Additional parking facilities required by the **Contractor** shall be the **Contractor's** responsibility.

1.07 SECURITY AND MAINTENANCE

A. General

1. Provide periodic indoor and outdoor maintenance and cleaning for temporary structures, furnishings, equipment, and services as specified herein above.

2. During other than normal daytime office working hours, provide a totally separate electronic security system monitored by a security agency for the **County's** facilities. All offices shall be equipped with exterior security flood lights automatically activated by darkness and in sufficient number and placement to provide adequate lighting of the office and the parking areas.

PART 2 - PRODUCTS (NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

A. Fill and grade sites for temporary structures to provide surface drainage.

3.02 INSTALLATION

A. Construct temporary field offices, first aid stations, and storage facilities on proper foundations and provide connections for utility all services.

B. Locate construction office facilities at locations within the Project approved by the **County**.

C. Determine the need for temporary utility services, including utility services for **County's** facilities and first aid stations, and make all arrangements with utility companies and governmental agencies to secure such services. Such services shall be provided at no additional cost to the **County**. Temporary utility services shall be furnished, installed, connected, and maintained by **Contractor** in a professional manner, satisfactory to the **County**, and shall be removed in like manner prior to final acceptance.

D. Provide an outside standpipe equipped with a non-freeze hose bib at the **County's** Project Office. The hose bib is to be sized for a standard ½-inch garden hose connection.

3.03 MAINTENANCE AND CLEANING

A. Repair and clean the offices, parking areas, and access routes, and provide complete professional janitorial services, including ample toilet paper and paper towels, in the **County's** facilities for the duration of the project. Cleaning shall be done on a daily basis, to the satisfaction of the **County**, during other than normal daytime office working hours. These services shall include daily sweeping, vacuuming, dusting, emptying of trash, cleaning of wash basins, bathroom and shower facilities, kitchen, daily mopping and monthly waxing of all vinyl floors and monthly shampooing of carpet. **Contractor** shall also provide for monthly exterminating services of the offices.

3.04 REMOVAL

A. Remove temporary field offices, contents, and services at a time when no longer needed. The office contents shall be packed, moved, and unpacked by the **Contractor** to a location designated by the **County**.

B. Remove foundations and debris to an approved dump site; grade site to required elevations; clean and restore areas to **County's** satisfaction.

+++ END OF SECTION +++

SECTION 01540
SECURITY AND SAFETY

Part 1 - GENERAL

1.01 SECURITY PROGRAM

A. The **Contractor** shall protect the Work, including all field office trailers and contents from theft, vandalism, and unauthorized entry.

B. The **Contractor** shall initiate a site security program at the time of mobilization onto the worksite, and the program shall provide adequate security for material stored and installed on site.

C. The **Contractor** shall maintain the security program throughout the Contract duration.

D. The **Contractor** and subcontractors are wholly responsible for the security of the storage compound and laydown areas, and for all plant, material, equipment, and tools at all times.

E. The **Contractor** shall provide the **County** with a list of 24-hour emergency phone numbers, including chain of command.

1.02 ENTRY CONTROL

A. The **Contractor** shall restrict entry of unauthorized personnel and vehicles onto the Project site.

B. The **Contractor** shall allow entry only to authorized persons with proper identification.

C. The **Contractor** shall maintain an Employee Log and Visitor Log and make the log available to the **County** upon request. This log shall be submitted to the **County** bi-weekly or as necessary.

D. The **Contractor** shall require all visitors to sign the Visitor Acknowledgment of the Program Site Rules/Visitor Log, which includes a release form. Copies of these forms shall be submitted to the **County** bi-weekly and maintained in the **Contractor's** security files on-site.

E. The **Contractor** shall require all employees to sign the Employee Acknowledgment of Project Site Rules Log included at the end of this Section. All employees, subcontractor employees, and lower tier contractor employees will receive a new employee orientation. Signing the Employee Log by the employee is certifying that the orientation training has been received.

F. The **County** has the right to refuse access to the site or request that a person or vehicle be removed from the site if found violating any of the Project safety, security conduct rules.

1.03 BARRICADES, LIGHTS AND SIGNALS

A. The **Contractor** shall furnish and erect such barricades, fences, lights, and danger signals, and shall provide such other precautionary measures for the protection of persons or property and of the work as necessary. Barricades shall be painted in a color that will be

visible at night. From sunset to sunrise, the **Contractor** shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction.

B. The **Contractor** will be held responsible for all damage to the work and any resulting injuries due to failure of barricades, signs, and lights. Whenever evidence is found of such damage, the **Contractor** shall immediately remove the damaged portion and replace it at **Contractor's** cost and expense. The **Contractor's** responsibility for the maintenance of barricades, signs, and lights shall not cease until the Project has been accepted by the **County**.

1.04 RESTRICTIONS

A. The **Contractor** shall not allow cameras on site or photographs taken except with approval of the **County**.

1.05 CONTRACTOR SAFETY/HEALTH AND SECURITY PLAN

A. Prior to the performance of any work, the **Contractor** will prepare a contract specific Safety/Health and Security Plan signed by an officer of the **Contractor's** organization. Adequacy is the responsibility of the **Contractor**.

B. The **County** will review the **Contractor's** safety plan for the adequacy of the plan. The plan shall:

1. Identify the person(s) responsible for implementation and enforcement of Safety/Health and Security rules and regulations for this Project.

2. Generally address safe work procedures for the activities within the **Contractor's** scope of work.

3. Include a new employee orientation program, which addresses job and site-specific rules, regulations and hazards.

4. Include the **Contractor's** Drug-Free Work Place Policy, including the substance abuse prevention and testing program.

5. Include provisions to protect all of the **Contractor's** employees, other persons, and organizations who may be affected by the work from injury, damage, or loss.

6. Comply with current Fed/OSHA, Safety/Health and Security Plan, facility safety program (when applicable), and locally accepted safety codes, regulations, and practices.

7. Include a site-specific emergency action and evacuation plan.

8. Include Hazard Communication/Right To Know Program.

9. Include security procedures for the **Contractor's** work, tools, and equipment.

10. Include the capability of providing the **County** with documentation to show compliance with their plan, plus accidents and investigation reports.

11. Address any other contract specific requirement, including the Unique Requirements of these specifications.

C. The **Contractor** shall provide a Job Safety Analysis (JSA) for the scope of work, prior to the start of work.

D. Review of the **Contractor's** Safety Plan by the **County** shall not impose any duty or responsibility upon the **County** for the **Contractor's** performance of the work in a safe manner.

E. The **Contractor** shall be fully responsible for the safety and health of its employees, its subcontractors, and lower tier contractors during performance of its work.

F. The **Contractor** shall provide the **County** with all safety reports, training records, competent person list, and accident reports prepared in compliance with Fed/OSHA and the Project Safety/Health and Security Plan.

1.06 PROJECT SAFETY COORDINATOR

A. The **Contractor** shall be responsible for the safety of the **Contractor's** and **County**'s employees, the County's personnel, and all other personnel at the site of the Work. The **Contractor** shall identify a Project Safety Coordinator on the job with an appropriate office on the job site to maintain and keep available safety records and up-to-date copies of all pertinent safety rules and regulations.

B. The Project Safety Coordinator shall:

1. Ensure compliance with all applicable health and safety requirements of all governing legislation.

2. Schedule and conduct safety meetings and safety training programs as required by law for all personnel engaged in the work.

3. Post all appropriate notices regarding safety and health regulations at locations that afford maximum exposure to all personnel at the job site.

4. Post the name, address, and hours of the nearest medical doctor; names and addresses of nearby clinics and hospitals; and the telephone numbers of the fire and police departments.

5. Post appropriate instructions and warning signs with regard to all hazardous areas or conditions.

6. Have proper safety and rescue equipment adequately maintained and readily available for any contingency. This equipment shall include such applicable items as: proper fire extinguishers, first aid kits, safety ropes and harnesses, stretcher, life savers, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, explosion meters, and any other equipment mandated by law.

7. Make inspections at least once daily in accordance with an inspection checklist report form to ensure that all machines, tools and equipment are in safe operating condition; that all work methods are not dangerous; and that all work methods are free of hazards.

8. Submit to the **County** upon request copies of all inspection checklist report forms, safety records and all safety inspection reports and certifications from regulating agencies and insurance companies.

9. Notify **County** of a serious accident immediately, followed by a detailed written report within twenty-four (24) hours. “Serious accident” is defined as that requiring an absence of work of more than 2 days and/or hospitalization.

10. Notify the **County** immediately in the event of a fatal accident.

11. Notify **County** of any accident claim against the **Contractor** or any sub-contractor immediately, followed up by a detailed written report on the claim and its resolution.

12. Review safety aspects of the **Contractor’s** submittals as applicable.

VISITOR ACKNOWLEDGMENT OF THE PROJECT SITE RULES

By Signing this Visitor's Log, I acknowledge that I understand and agree to abide by the project rules outlined below.

In consideration of my receipt of a visitor's pass as issued by the **County** directly or indirectly for the **County**, I waive on behalf of myself, my heirs, employer, legal representatives, and assigns, and hereby release and discharge the **County**, Program Manager, Designer, and its subcontractors and consultants and each of its directors, officers, employees, representatives, and agents from any and all claims, actions, causes of action, or any charge of any kind whatsoever that may arise or could arise in the future as a result of my being present at the facility, including injury, death, or property damage, whether or not caused by the fault or negligence of any of the parties released hereunder.

I further acknowledge that I have been briefed on specific hazards, hazardous substances that are on site, and the site emergency action procedure.

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of **County** property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing **County** property
- Failure to use sanitary facilities
- Failure to report accidents or job related injuries
- Being under the apparent influence of drugs, alcohol, or other intoxicants, or in possession of drugs, alcohol, or other intoxicants on the property
- Wearing shorts or tennis shoes on the jobsite
- Failure to wear a hardhat/safety glasses.
- Gambling at any time on the project
- Fighting, threatening behavior, or engaging in horseplay on the project
- Smoking in unauthorized areas on the project
- Open fire cooking or making unauthorized fires on project property
- Selling items or raffles without authorization
- Use of unauthorized cameras on the project
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area
- Failure to wear designated identification [site-specific]
- Failure to use designated gates

I have read, understand, and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

VISITOR LOG

THE SIGNING OF THIS LOG ACKNOWLEDGES I HAVE READ AND UNDERSTAND AND AGREE TO ABIDE BY THE PROJECT RULES OUTLINED ABOVE. THIS IS NOT A VEHICLE ACCESS PERMIT.

VISITOR'S NAME (PRINT)	SIGNATURE	COMPANY VISITED	DATE	IN	OUT

EMPLOYEE ACKNOWLEDGMENT OF THE PROJECT SITE RULES

By Signing this Employee Log, I acknowledge that I understand and agree to abide by the project rules outlined below.

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of **County** property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing **County** property
- Failure to use sanitary facilities
- Failure to report accidents or job related injuries
- Under the apparent influence of drugs, alcohol, or other intoxicants or in possession of drugs, alcohol or other intoxicants on the property
- Wearing shorts or tennis shoes on the jobsite
- Failure to wear a hardhat
- Gambling at any time on the project
- Fighting, threatening behavior, or engaging in horseplay on the project
- Smoking in unauthorized areas on the project
- Open fire cooking or making unauthorized fires on project property
- Selling items or raffles without authorization
- Use of unauthorized cameras on the project
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area
- Failure to wear designated identification [site-specific]
- Failure to use designated gates

I have read, understand, and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

EMPLOYEE LOG

BY SIGNING THIS LOG, I ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND AND AGREE TO ABIDE BY THE PROJECT RULES OUTLINED ABOVE AND ALL STATE, FEDERAL, LOCAL, OR ANY OTHER CONTRACT OBLIGATIONS THAT MAY APPLY. I FURTHER ACKNOWLEDGE THAT I HAVE BEEN ORIENTED AS TO THE SITE-SPECIFIC HAZARDS, ANY HAZARDOUS SUBSTANCES I MAY BE EXPOSED TO WHILE ON THE SITE, AND THE SITE/COMPANY EMERGENCY ACTION PROCEDURES, BY A REPRESENTATIVE OF THE COMPANY.

EMPLOYEES (PRINT)	SIGNATURE	COMPANY NAME	DATE
Signature of Company Representative		Date Signed	

+ + + END OF SECTION 01540 + + +

SECTION 01550
TRAFFIC REGULATION

PART 1 - GENERAL

1.01 SCOPE

A. The work specified in this section includes the provision of products, permits, services, procedures, and personnel by the **Contractor** to affect traffic control during the Work. For this project, Rockbridge Road Asbestos Cement Water Main Replacement, the awarded **Contractor**(s) shall coordinate traffic control with each other and any contractors working in the area and shall proceed only with **County's** approval.

1.02 TRAFFIC CONTROL MANAGER REQUIREMENTS

A. The **Contractor** shall designate a qualified individual as the Traffic Control Manager (TCM) who shall be responsible for selecting, installing, and maintaining all traffic control devices in accordance with the Plans and Specifications and the Manual of Uniform Traffic Control Devices (MUTCD). A written resume documenting the experience and credentials of the TCM shall be submitted and accepted by the **County** prior to beginning any work that involves traffic control. The TCM shall be available on a twenty-four (24) hour basis to perform his duties. If the work requires traffic control activities to be performed during the daylight and nighttime hours it may be necessary for the **Contractor** to designate an alternate TCM. An alternate TCM must meet the same requirements and qualifications as the primary TCM and be accepted by the **County** prior to beginning any traffic control duties. The Traffic Control Manager's traffic control responsibilities shall have priority over all other assigned duties.

B. As the representative of the **Contractor**, the TCM shall have full authority to act on behalf of the **Contractor** in administering the Traffic Control Plan. The TCM shall have appropriate training in safe traffic control practices in accordance with Part VI of the MUTCD. In addition to the TCM all other individuals making decisions regarding traffic control shall meet the training requirements of Part VI of the MUTCD. The TCMs shall supervise the initial installation of traffic control devices. The **County,** prior to the beginning of construction, will review the initial installation. Modifications to traffic control devices as required by sequence of operations or staged construction shall be reviewed by the TCMs.

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

A. The **Contractor** shall provide post-mounted and wall-mounted traffic control and informational signs as specified and required by local jurisdictions.

B. The **Contractor** shall provide automatic traffic control signals as approved by local jurisdictions.

C. The **Contractor** shall provide traffic cones and drums, and flashing lights as approved by local jurisdictions.

D. The **Contractor** shall provide flagmen equipment as required by local jurisdictions.

PART 3 - EXECUTION

3.01 PERMITS

A. The **Contractor** shall obtain permits from authorities having jurisdiction over road closures before closing any road. The **Contractor** shall use forms provided by authorities having jurisdiction (DeKalb County Department of Public Works, GDOT, etc).

B. The **Contractor** shall either fax or hand carry permit applications to the DeKalb County Department of Public Works. Permit applications shall indicate the time (in days); length (in feet); the number of lanes; and the purpose of the closure.

C. All permits are approved for operations during off-peak hours (9:00 a.m. to 4:00 p.m.) unless special approval is received.

D. Operations between the hours of 6:00 p.m. and 10:00 p.m. and on Saturdays and Sundays shall require approval by the **County**

E. Full street closures permits require ninety-six (96) hours advance notice prior to road closure. The following additional information is required prior to approval:

1. The recommended detour route with signage and Traffic Management Plan as per the Manual of Uniform Traffic Control Devices (MUTCD).

2. A copy of the resident and/or business notification letters about the closure. The residents/businesses located between the detour route must be notified about the closure at least five (5) business days prior to the proposed closure.

F. The DeKalb County Department of Public Works will return full road closure permit applications to the **Contractor.** The **Contractor** shall have received the permit application and the Fire Chief, Chief of Police, DeKalb Hospital, MARTA, and the DeKalb County Board of Education shall be notified in writing at least seventy-two (72) hours before commencing road closure activities.

The DeKalb County Department of Public Works will return lane closure permit applications to the **Contractor.** The **Contractor** shall have received the permit application and shall require a minimum of forty-eight (48) hour notice prior to closure. The **Contractor** shall continuously maintain the safety of the traveling public during lane closures in accordance with the requirements of the MUTCD and as stipulated by public officers. Lane closure permits are issued during operating hours on Mondays through Fridays.

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3.02 PREPARATION OF TRAFFIC CONTROL PLANS

A. The Traffic Control Plan drawings included with the Contract Documents shall only be considered as a guide and are not intended to contain all the traffic regulation details that may be required by the specifications, permitting agencies and the MUTCD. The **Contractor** shall develop detailed staging and traffic control plans for performing specific areas of the Work including but not limited to all requirements for certified flagmen, additional traffic control devices, traffic shifts, detours, paces, lane closures or other activities that disrupt traffic flow. The **Contractor** shall submit these plans in accordance with the Specifications to receive final approvals from permitting agencies and provide any and all required traffic control devices as required by both the permitting agencies and these specifications at no additional cost to the **County**.

3.03 CONSTRUCTION PARKING CONTROL

A. The **Contractor** shall control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and **County's** operations.

B. The **Contractor** shall monitor parking of construction personnel's vehicles in existing facilities and maintain vehicular access to and through parking areas.

C. The **Contractor** shall prevent parking on or adjacent to access roads or in non-designated areas.

3.04 MAINTENANCE OF TRAFFIC

A. Whenever and wherever, in the **County's** opinion, traffic is sufficiently congested or public safety is endangered, the **Contractor** shall furnish uniformed officers to direct traffic and to keep traffic off the roadway area affected by construction operations.

B. When the Contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the **Contractor's** performance of Work that is otherwise provided for in the Plans and these Specifications, the **Contractor** shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to safely accommodate traffic. The **Contractor** shall furnish, erect, and maintain barricades, warning signs, flagmen, and other traffic control devices in conformity with the requirements of the Georgia Department of Transportation and other Local Jurisdictions. The **Contractor** shall also construct and maintain in a safe condition any temporary connections necessary to ingress to and egress from abutting property or intersecting roads, streets, or highways. The **Contractor** shall maintain traffic in accordance with any traffic control plans furnished with and made a part of the Plan assembly.

C. The **Contractor** shall make its own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of traffic as specified in this section.

D. Unless specified in the Plans or these Specifications and subject to the approval of the **County**, the cost of maintaining traffic specified in this section shall be considered incidental to the Work and no separate measurement or payment will be made.

3.05 UNIFORMED POLICE OFFICER FOR TRAFFIC CONTROL

A. The **Contractor** shall provide uniformed police officers to regulate traffic when construction operations encroach on public traffic lanes, as approved by the **County**.

B. Officers will be currently employed by a local jurisdiction, be in full uniform, and have full arrest power while working.

C. Officers will be employed and paid by the **Contractor**.

D. It shall be the Officers' responsibility to assist in the direction of traffic within the construction site.

3.06 FLAGMEN

A. The **Contractor** shall provide trained and equipped flagmen to regulate traffic when traffic or construction operations encroach on public traffic lanes.

3.07 FLASHING LIGHTS

A. The **Contractor** shall use flashing lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

A. The **Contractor** shall consult with authorities and establish public thoroughfares to be used for haul routes and site access.

B. The **Contractor** shall confine construction traffic to designated haul routes.

C. The **Contractor** shall provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.09 ROAD CLOSURES ON COUNTY ROADS

A. No street, road, or highway shall be closed without the permission of the owner of any street, road, or highway and the fire department having jurisdiction. Prior to closing a street, road, or highway, signs shall be posted for a minimum of seven (7) days prior to actual closing, forewarning of the imminent closing. The **County** shall determine the information to be placed upon the signs by the **Contractor**. Where traffic is diverted from the Work, the **Contractor** shall provide all materials and perform all work for the construction and maintenance of all required temporary roadways, structures, barricades, signs, and signalization.

B. To obtain approval to close a road or street maintained by the **County**, the **Contractor** shall proceed as follows:

1. The **Contractor** shall obtain approval of his traffic plan from the **County.** The traffic plan must be in accordance with the requirements of the Georgia Department of Transportation and DeKalb County.

2. The **Contractor** shall obtain a utility permit.

3. The **Contractor** shall apply in writing to the **County** and obtain a permit to close the road on a specific date

4. The **Contractor** shall obtain a permit from the **County** before posting closure signs. Signs shall be posted for seven (7) days prior to the first day of closure. Signs shall be acceptable to the **County**.

5. Emergency road closures will be handled by the **County**.

3.010 PROCEDURES FOR TRAFFIC DETOUR ROUTE PLAN

A. The **Contractor** shall provide to the **County** a sketch map showing the traffic detour route plan. The sketch map need not be drawn to scale, but should resemble, as closely as possible, the actual location. The sketch map shall be drawn in a manner so as to provide emergency agencies a better understanding of the detour for quick response. The sketch map shall include directional arrows showing the flow of traffic.

B. "Road Closed Ahead" signs shall be erected before the start point of the detour, indicating the name of the street closed.

C. Detour signs with appropriate directional arrows shall be erected at every intersection along the detour route until the end of the detour, when the traffic is back to the original street.

D. The **Contractor** shall erect an "End Detour" sign at the end of the detour.

E. Each detour and "End Detour" sign shall be accompanied by an accessory plate indicating the name of the street being detoured.

F. The **Contractor** shall apply appropriate traffic control measures in accordance with the requirements of the MUTCD and DeKalb County codes.

3.10 BARRICADES AND WARNING SIGNS

A. The **Contractor** shall furnish, erect, and maintain all barricades and warning signs for hazards necessary to protect the public and the Work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated or reflectorized.

B. For vehicular and pedestrian traffic, the **Contractor** shall furnish, erect, and maintain barricades, warning signs, lights, and other traffic control devices in conformity with the requirements of the Georgia Department of Transportation and DeKalb County.

C. The **Contractor** shall furnish and erect all barricades and warning signs for hazards prior to commencing all Work that requires such signage, and shall maintain the barricades and warning signs for hazards until their dismantling is directed by the **County**.

3.11 REMOVAL

A. The **Contractor** shall remove equipment and devices when no longer required and repair damage caused by installation.

+++END OF SECTION 01550+++

SECTION 01600
GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. At the time they are purchased, all installed materials and equipment shall be the latest version of the manufacturer's product line and not outdated by newer versions. Materials and equipment that show any signs of extended storage, such as corrosion, scratches, or dents will not be accepted.

B. All equipment used for performing the Work shall conform to the latest version of all applicable safety standards, including but not limited to OSHA requirements. The **Contractor** shall not exceed or ignore any requirements or recommendations of the equipment manufacturer. Equipment not meeting requirements of this Section will be barred from use on the project.

C. All installed material and equipment shall meet or exceed the latest applicable code requirements, including but not limited to Underwriters Laboratory, Standard Building Code, and OSHA, as well as requirements of these Specifications. Where there is conflict with requirements of the Contract Documents and code requirements, the **Contractor** shall comply with the more stringent requirements with no additional compensation to the **Contractor**.

PART 2 - MATERIALS AND EQUIPMENT

2.01 ANCHOR BOLTS

A. All anchor bolts shall be ANSI type 316 stainless steel unless otherwise specified or indicated, and shall conform to requirements of this Section and the material articles in the appropriate Sections they are used.

B. All anchor bolts shall be supplied by the manufacturer or fabricator of the specific material or equipment to be installed.

C. Design criteria for anchor bolts

1. When the size, length, or load capacity of an anchor bolt, expansion anchor, or concrete insert is not shown on the Drawings, provide the size, length, and capacity required to carry the design load times a minimum safety factor of four.

2. Determine design loads as follows:

a. For equipment anchors, use the design load recommended by the manufacturer and approved by the **County**.

b. For pipe hangers and supports, use one half the total weight of pipe, fittings, valves, accessories, and water contained in full pipe, between the hanger or support in question and adjacent hangers and supports on both sides.

c. Allowances for vibration are included in the safety factor specified above.

d. Anchors shall develop ultimate shear and pull-out loads in concrete of not less than the following values:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
½	4,500	6,300
⅝	6,900	7,700
¾	10,500	9,900

3. Embedment depth shall be 6 inches for epoxy anchors and 4 inches for steel expansion anchors, unless noted otherwise on the Drawings.

D. Anchor Type and Manufacturer

1. Where epoxy anchors are noted on the Drawings, provide ANSI type 316 stainless steel threaded rod with Speed Bond #1 epoxy injection as manufactured by Prime Resins, Inc. or approved equal.

2. For all other applications, provide ANSI type 316 steel expansion anchors from one of the following manufacturers:

o Hilti, Incorporated,

o Ramset, Incorporated, or

o Approved equal.

3. Install anchors per manufacturer's recommendations and this Section.

a. Blow out drilled anchorage holes with compressed air before installing anchor.

2.02 CONNECTION BOLTS

A. Materials shall be as specified in other Sections of the Specifications, or as shown on the Drawings. Where materials are not specified or shown

on the Drawings, they shall be of ANSI Type 316 stainless steel, with ANSI Type 316 stainless steel nuts and washers.

B. Unless otherwise specified, stud, tap, and machine bolts and nuts shall be ANSI Type 316 stainless steel and shall conform to the requirements of ASTM Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307-80. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to AN Standard B1.1-1974 for Unified Inch Screw Threads (UN and UNR Thread Form).

2.03 CONCRETE INSERTS

A. Concrete inserts for hangers shall be designed to support safely, in the concrete that is used, the maximum load that can be imposed by the hangers used in the inserts. Inserts for hangers shall be of a type that will permit adjustment of the hangers both horizontally (in one plane) and vertically, and locking of the hanger head or nut. All inserts shall be galvanized, then epoxy phenolic primed and top coated with PVC, using thermal bond process.

2.04 SLEEVES

A. Unless otherwise indicated on the Drawings or specified in these Specifications, openings for the passage of pipes through floors and walls shall be formed of sleeves of standard-weight, stainless-steel pipe. The sleeves shall be of ample diameter to pass the pipe and its insulation, if any, and to permit such expansion as may occur. Sleeves shall be of sufficient length to be flush at the walls and the bottom of slabs and to project 4 inches above the finished floor surface. Threaded nipples shall not be used as sleeves.

B. Sleeves in exterior walls below grade or in walls to have liquids on one or both sides shall be as detailed on the Approved Drawings and specified in other sections.

C. All sleeves shall be set accurately before the concrete is placed or shall be built in accurately as the masonry is being built.

2.05 ELECTRICAL EQUIPMENT ENCLOSURES

A. All items of electrical equipment that are furnished with process equipment shall conform to the requirements specified under the appropriate electrical sections of the specifications. Enclosures for electrical equipment such as switches, starters, etc., shall conform to the requirements specified under the appropriate electrical sections of the specifications.

2.06 EQUIPMENT DRIVE GUARDS

A. All equipment driven by open shafts, belts, chains, or gears shall be provided with acceptable all-metal guards enclosing the drive mechanism.

Guards shall be constructed of epoxy paint coated, galvanized sheet steel or galvanized woven wire or expanded metal set in a frame of galvanized steel members. Guards shall be secured in position by steel braces or straps, which will permit easy removal for servicing the equipment. The guards shall conform in all respects to all applicable safety codes and regulations.

2.07 NAMEPLATES

A. With the exception of the items mentioned below, each piece of equipment shall be provided with a substantial nameplate of non-corrodible metal, securely fastened in place and clearly and permanently inscribed with the manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information as appropriate.

B. This requirement shall also apply to standard, manually operated gate, lobe, check and plug valves.

C. Each process valve shall be provided with a substantial tag of non-corrodible metal securely fastened in place and inscribed with an identification number in conformance with the tag numbers indicated on the Process and Instrumentation Drawings.

2.08 LUBRICANTS

A. During testing and prior to acceptance, the **Contractor** shall furnish all lubricants necessary for the proper lubrication of all equipment furnished under this contract.

2.09 PROTECTION AGAINST ELECTROLYSIS

A. Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other approved acceptable materials.

2.10 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

A. Packing and Shipping:

1. Product and materials shall be shipped and handled in ways that will prevent damage.

2. Equipment shall be protected against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to the project site. Bearing housing, vents and other types of openings shall be wrapped or otherwise sealed to prevent contamination by grit and dirt.

3. Ship equipment, material, and spare parts in assembled units except where partial disassembly is required by transportation regulations or for protection of components.

4. Pipe and appurtenances shall be handled, stored, and installed as recommended by the manufacturer. Pipes shipped with interior bracing shall have the bracing removed only when recommended by the pipe manufacturer.

5. Stiffeners shall be used where necessary to maintain shapes and to provide rigidity.

6. Each item or package shall be marked with the number unique to the specification reference covering the item. Spare parts shall be packed in containers bearing labels clearly designating contents and pieces of equipment for which intended.

B. Acceptance at Site:

1. Damaged items will not be permitted as part of the work except in cases of minor damage that have been satisfactorily repaired and are acceptable to the **County**.

2. Damage shall be corrected to conform to the requirements of the Contract before the assembly is incorporated into the Work.

3. The **Contractor** shall bear the costs arising from dismantling, inspection, repair, and reassembly.

C. Storage and Protection:

1. During the interval between delivery to the site and installation, equipment and materials shall be stored in an enclosed space affording protection from weather, dust, and mechanical damage, and providing favorable temperature, humidity, and ventilation conditions to ensure protection from equipment deterioration. Manufacturer's recommendations shall be adhered to in addition to these requirements.

2. Any equipment and materials located outdoors shall be protected against moisture condensation. Equipment shall be stored at least 6 inches above ground. Temporary power shall be provided for space heaters or other heat sources for control of moisture condensation. Space heaters or other heat sources shall be energized without disturbing the sealed enclosure.

2.11 UNIT RESPONSIBILITY

A. Equipment systems made up of two or more components shall be provided as a unit by the responsible manufacturer. Unless otherwise specified, the **Contractor** shall obtain each system from the supplier of the driven equipment, and the supplier shall provide all system

components to enhance compatibility, ease of construction, and efficient maintenance. The **Contractor** shall be responsible to the **County** for performance of all systems in accordance with the provisions of the General Requirements of the Contract Documents.

B. Where the detailed specifications require the **Contractor** to furnish a certificate of unit responsibility, such certificate shall be executed by the manufacturer. No other submittal material shall be processed until the Certificate of Unit Responsibility has been received and has been found to be satisfactory.

+ + + END OF SECTION 01600 + + +

SECTION 01610
TRANSPORTATION AND HANDLING

PART 1 GENERAL

1.01 SCOPE

A. The **Contractor** shall provide transportation of all equipment, materials, and products furnished under these Contract Documents to the Work site. In addition, the **Contractor** shall provide preparation for shipment, loading, unloading, handling, and preparation for installation and all other work and incidental items necessary or convenient to the **Contractor** for the satisfactory prosecution and completion of the Work.

B. All equipment, materials, and products damaged during transportation or handling shall be repaired or replaced by the **Contractor** at no additional cost to the **County** prior to being incorporated into the Work. Acceptance of damaged goods is at the discretion of the **County**.

1.02 TRANSPORTATION

A. All equipment shall be suitably boxed, crated, or otherwise protected during transportation.

B. Where equipment will be installed using existing cranes or hoisting equipment, the **Contractor** shall ensure that the weights of the assembled sections do not exceed the actual capacity of the cranes or hoisting equipment.

C. Small items and appurtenances such as gauges, valves, switches, instruments, and probes that could be damaged during shipment shall be removed from the equipment prior to shipment, packaged, and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.03 HANDLING

A. All equipment, materials, and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.

B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.

C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.

D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

+++ END OF SECTION 01610 +++

SECTION 01640
MANUFACTURERS' SERVICES

PART 1 - GENERAL

1.01 DEFINITIONS

A. Reference Section 01650, FACILITY STARTUP.

B. Man-Day: One person for 8 hours within regular **Contractor** working hours.

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:

1. Preliminary Training Plan: Submit within 120 days after Notice to Proceed.

2. Training Schedule: Submit not less than 30 days prior to start of equipment installation and revise as necessary for acceptance.

3. Final Training Plan: Submit after training coordination meeting.

4. Training Materials:

   a. Submit written outlines of proposed training sessions not less than 30 days prior to scheduled training.
   b. Furnish complete training materials, to include operation and maintenance data as required in this section. Provide 12 extra copies of all training materials to the **County**.
   c. Quality Control Submittals: When specified in the individual Specifications, submit:
      1. Qualifications and resume of Manufacturer's Representative performing specified services.
      2. Manufacturer's authorized representative's signature on the Certificate of Proper Installation, signed on the form appended to this Section.

1.03 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. This individual shall be an authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of the respective equipment, subsystem, or system. Additional qualifications may be specified elsewhere.

B. The representative shall be subject to acceptance by the **County**. No substitute representatives will be allowed unless prior written approval by the **County** has been given.

1.04 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Where manufacturers' services are specified, furnish a manufacturers' qualified representatives. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, additional time required to perform the specified services shall be considered incidental work.

B. Schedule manufacturers' services to avoid conflicting with other onsite testing or other manufacturers' onsite services.

1. Determine that all conditions necessary to allow successful testing have been met before scheduling services.

2. Only those days of service approved by the **County** will be credited to fulfill the specified minimum services.

3. If specified, each manufacturer's onsite services shall be 8 hours minimum and include as a minimum:

a) Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of **Contractor**'s assembly, erection, installation, or application procedures.

b) Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish written approval of installation.
i.

c) Revisiting the site as required to correct problems and until installation and operation are acceptable to **County**.
i.

d) Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
i.

e) Assistance during functional and performance testing and startup demonstration, and until product acceptance by the **County**.
i.

f) Training of **County** personnel in the operation and maintenance of the respective product as required.
i.

g) Completion of Manufacturer's Certificate of Proper Installation (form enclosed at end of this section) with applicable certificates for proper installation and initial, interim, and final test or service.
i.

h) Additional requirements that may be specified elsewhere.

1.05 TRAINING PLAN

A. Preliminary Training Plan: If specified, and within 120 days after Notice of Award, submit for each proposed course:

1. Title and objectives

2. Training schedule
3. Prerequisite training and experience of attendees
4. Recommended types of attendees (e.g., managers, **County**'s operators and maintenance personnel)
5. Course description and outline of course content
6. Duration
7. Location (e.g., training center or site)
8. Format (e.g., lecture, self-study, demonstration, hands-on)
9. Instruction materials and equipment requirements

B. Final Training Plan: Submit the following after training coordination meeting, if specified.

1. Updated versions of course descriptions from preliminary training plan.
2. Who will attend each course.
3. Schedule of training courses, including dates, durations, and locations of each class.
4. Detailed course schedule for each day showing time allocated to each topic.
5. Resumes of instructors providing the training.

1.06 TRAINING SCHEDULE

A. List specified equipment and systems with respective manufacturers that require training services of manufacturers' representatives and show:

1. Estimated dates for installation completion.
2. Estimated training dates to allow for multiple sessions when several shifts are involved.

B. Adjust training schedule to ensure training of appropriate personnel as deemed necessary by the **County**, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.

C. Coordinate with Progress Schedules as specified in Special Conditions and Section 01650, Facility Startup.

1.07 TRAINING COUNTY'S PERSONNEL

A. Furnish trained, articulate personnel to coordinate and expedite training, be present during training coordination meetings with **County**. These personnel also shall be familiar with operation and maintenance manual information.

B. Furnish manufacturers' representatives for detailed classroom and hands-on training to **County**'s personnel on operation and maintenance of the specified product (system, subsystem, component) and as may be required in applicable Specifications.

C. Manufacturers' Representatives shall be familiar with plant operation and maintenance requirements as well as with specified equipment.

D. Pre-startup Training:

1. Coordinate training sessions with the **County**'s operating personnel and manufacturers' representatives.
2. Complete at least 7 days, but no more than 14 days, prior to actual startup.

E. Post-Startup Training: Furnish and coordinate training of the **County**'s operating personnel by respective manufacturers' representatives, who also shall be required to provide a one-day follow-up visit.

F. Taping of Training Sessions: The **County** will provide audio/video taping of all training sessions. Manufacturers' trainers shall provide appropriate props, such as charts, photographs, and samples in large enough sizes to be videotaped. All trainers shall provide their full cooperation to the **County**'s video technician.

1.08 SUPPLEMENTS

A. The supplements listed below, following END OF SECTION, are part of this Specification.

1. Manufacturer's Certificate of Proper Installation
2. Manufacturer's Instruction Certification Form

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

+++ END OF SECTION 01640 +++

DEKALB COUNTY
MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

COUNTY _____ EQPT SERIAL NO:_____

EQPT TAG NO:_____ EQPT/SYSTEM:_____

PROJECT NO:_____ SPEC. SECTION:_____

SITE LOCATION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐	Installed in accordance with Manufacturer's recommendations.
☐	Inspected, checked, and adjusted.
☐	Serviced with proper initial lubricants.
☐	Electrical and mechanical connections meet quality and safety standards.
☐	All applicable safety equipment has been properly installed.
☐	System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)
☐	System has been started up and meets or exceeds performance requirements.

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date:_____

Manufacturer:_____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

DEKALB COUNTY
MANUFACTURER'S INSTRUCTION CERTIFICATION FORM

Contract No.: _____

Specification Section: _____

Equipment Name: _____

Contractor: _____

Manufacturer of Equipment Item: _____

The undersigned manufacturer certifies that a service **County** has instructed the **County** operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)

Startup procedure reviewed _____
Shutdown procedure reviewed _____
Normal operation procedure reviewed _____

Others: _____ _____
_____ _____
_____ _____

Maintenance Check List (check appropriate spaces)

Described normal oil changes (frequency) _____
Described special tools required _____
Described normal items to be reviewed for wear _____
Described preventive maintenance instructions _____
Described greasing frequency _____

Others: _____ _____
_____ _____
_____ _____

_____ _____
Date Manufacturer

_____
Signature of Authorized Representative

_____ _____
Date Signature of **County**'s Representative

Date Signature of **Contractor**'s Representative

SECTION 02000
SITE WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. These general site work requirements apply to all site work operations. Refer to Specification sections for specific product and execution requirements.

1.02 QUALITY ASSURANCE

A. Comply with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.

B. Obtain and pay for all required inspections, permits, and fees. Provide notices required by governmental authorities.

1.03 PROJECT CONDITIONS

A. Locate and identify existing underground and overhead services and utilities within Contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations. All costs associated with the damaged utility shall be the **Contractor's** expense.

B. Arrange for disconnection or disconnect and seal or cap all utilities and services designated to be removed or abandoned before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.

C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the **County** and the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company to keep active services in operation.

D. Locate, protect, and maintain benchmarks, monuments, control points, and project engineering reference points. Reestablish disturbed or destroyed items at **Contractor's** expense.

E. Perform site work operations and the removal of debris and waste materials to ensure minimum interference with streets, walks, and other adjacent facilities.

F. Obtain governing authorities' written permission when required to close or obstruct street, walks, and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.

G. Control dust caused by work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

H. Protect existing buildings, paving, and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and all costs associated with the damages, including restoration of damaged items,

shall be at **Contractor's** expense.

I. Protect and maintain street lights, utility poles, and services, traffic signal control boxes, curb boxes, valves, and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, parking meters, and postal mailboxes with the applicable governmental agency. Provide for temporary relocation when required to keep facilities and services in operation during construction work.

J. Preserve from injury or defacement all vegetation and objects designated to remain.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment: As selected by **Contractor**, except as indicated in Contract documents.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.

B. Consult the records and drawings of adjacent work and of existing services and utilities that may affect site work operations.

+++ END OF SECTION 02000 +++

SECTION 02020
USE OF EXPLOSIVES

PART 1 - GENERAL

1.01 SCOPE

A. This section covers the use of explosives and blasting. Limit the use of explosives in the Work to the practicable minimum by utilizing mechanical means of excavation to the maximum feasible extent. Blasting shall be limited and shall be approved by the **County**.

B. Related Work Specified Elsewhere:

1. Section 01380 Photographic Documentation
2. Section 02000 Site Work
2. Section 02200 Earthwork
3. Section 02324 Trenching and Trench Backfill
4. Section 02140 Dewatering

C. Definitions:

1. Controlled blasting is excavation of rock in which the blast hole size, spacing, depth, and burden, and the charge size, depth, and delay sequence are carefully controlled to excavate the rock to the required limits. Controlled blasting minimizes overbreak and fracturing of the rock beyond the design lines.

1.02 GENERAL

A. Perform blasting only with permits from the appropriate jurisdictional agencies. Necessary permits include an Explosives License issued by the Georgia Safety Fire Commissioner, and users' permits obtained from DeKalb **County**. Obey all local, State, Federal, and other governmental regulations applying to transportation, handling, storage, and use of explosives, including the requirements of the DeKalb **County** Fire Department, the State of Georgia, and applicable regulations of the Occupational Safety and Health Administration.

B. Perform blasting operations in trenches, shafts, and other open excavations only during daylight hours. Perform blasting operations only from 7:00 a.m. to 10:00 p.m. No blasting shall be performed on Saturdays, Sundays, or on the public holidays observed by the **County**. If an emergency prevents a blast being fired during the permitted hours and the holes are loaded, the blast shall be fired as soon as safety allows. In the event that blasting is found necessary outside the permitted hours, the **Contractor** shall receive approval from the **County** and inform local residents within hearing and vibration range, as well as the jurisdictional agencies prior to firing.

C. Furnish, install, and operate at each site where blasting is being performed, using electric methods of initiation, an approved thunderstorm monitor and lightning warning device. Make adequate provisions for transmitting alarms from the device to all locations where preparation for blasting, using electric initiation, are in progress. Install and maintain the system in accordance with the manufacturer's recommendations. Test the entire monitoring and alarm system for satisfactory operation at intervals not exceeding two weeks, and suspend blasting operations until any defects have been corrected.

D. Employ the services of a blasting consultant, satisfactory to the **County** and experienced in predicting and evaluating the effects of blasting on nearby structures, such that vibration levels at these structures do not exceed a level that will damage the structures or their contents, or cause undue alarm to their occupants. Employ the blasting consultant to plan and evaluate blasting operations.

E. Preconstruction Video Survey and Inspections

1. The **Contractor** is expressly advised that the protection of buildings, structures, bridges, utilities, and related work adjacent to and in the vicinity of its operations, wherever they may be, is solely its responsibility. Existing condition inspection of buildings, bridges, or other structures in the immediate vicinity of any blasting operations shall be performed by and be the responsibility of the **Contractor**. The inspection corridor shall extend within a 500-foot radius of any proposed blasting operations. The **Contractor** shall retain an independent consultant, specializing in preconstruction surveys, to conduct the required inspections. The video survey and inspections shall conform to the requirements of Section 01380, Photographic Documentation.

2. Prior to the start of blasting operations, the **Contractor** shall have the independent consultant make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions that might be aggravated by blasting or other operations. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the owners or agents of adjacent buildings, structures, facilities, etc., and to the satisfaction of the **County**. This does not preclude conforming to the requirements of the insurance underwriters. Two copies of surveys, photographs, videos, reports, etc., shall be submitted to the **County**.

3. The cost of all pre-construction video surveys and inspections shall be borne by the **Contractor**.

1.03 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements Conditions of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. At least 60 days prior to commencement of blasting operations, a copy of all applicable licenses and permits for the purchase, transportation, storage, and use of explosives.

2. At least 60 days prior to commencement of blasting operations, a blasting monitoring plan shall be prepared and submitted to the **County**. This plan shall include the name of the Blasting Vibration Consultant who will be responsible for establishing the monitoring program and interpreting the vibration readings; names of the trained personnel provided to operate the monitoring equipment; the type and model of blasting seismograph proposed for use; the number and location of proposed monitoring stations; the methods to be used to coordinate blast detonation with recording of the blast; and the steps to be taken if blasting vibrations exceed or seem likely to exceed the vibration limits.

3. At least 60 days prior to any blasting operation, the initial blast design for that location shall be prepared and submitted to the **County**. This shall include the number, location, diameter, depth, and inclination of drill holes on a scale drawing of the excavation or heading face; type and weight of explosive in each hole; delay arrangement showing delay period in each hole; total weight of explosive material in the blast and maximum charge per delay; the method of detonation; calculations of peak particle velocities and air blast overpressures; and the precautions to be taken to prevent flying rock or other debris. Manufacturers' data sheets shall be provided for all explosives and accessories to be used.

4. At least 30 days prior to any blasting operation, the blasting safety plan shall be prepared and submitted to the **County**. This shall include the health and safety requirements of all applicable legislation; certificates from all regulating agencies and relevant insurance companies; outline of safety training program for the **Contractor's** and **County's** personnel; communication and warning procedures; samples of all report and inspection forms; and lightning protection plan.

5. Within the working day following each blast, the blasting records and information for each blast detonated shall be maintained. These shall include:
    a. A complete description, including the location, date, and exact time of the blast; name and signature of person in responsible charge of loading and firing and their blaster permit number; details of each blast as listed above for the initial blast design and any departures from the blast design; comments regarding any misfires, unusual results or unusual effects; any other records required by applicable regulations; and the name and signature of the person preparing the report.

    b. The monitoring record, including the location, date, and exact time of the blast; general weather conditions; the locations of

seismographs and type of ground on which they were located, instrument identification and their distances from the blast; the measured peak particle velocities; air blast overpressure records, if appropriate; and the name and signature of the observer.

1.04 QUALITY ASSURANCE

A. Work Experience:

1. The blasting consultant shall have at least 10 years of blasting experience. The blasting consultant shall be on call throughout the entire period that blasting is performed and shall be available at the site within 2 days at any time that the blasting consultant's services may be necessary as determined by the **County**.

2. Blasting supervisors shall have a minimum of 5 years' experience in supervising the loading and firing of charges for the excavation of shafts and trenches and shall have all necessary licenses and permits required by the appropriate jurisdictional agencies.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Only non-nitroglycerine explosives shall be used.

B. All explosives and detonators used in the work shall be less than one year old. Explosives and detonators shall be stored in the manufacturers' boxes with date codes to allow the **County** to determine the age of the materials. Blasting products shall not be brought onto the site if the date codes are missing. When, in the **County's** opinion, any blasting product is either of excessive age or in a deteriorated condition, that material shall not be used until its age or quality can be shown to be satisfactory.

2.02 EQUIPMENT

A. Use dust suppressant measures with air-powered or air-flush rock drilling equipment.

B. Wet down the muck pile after blasting to control dust during mucking operations.

PART 3 - EXECUTION

3.01 GENERAL

A. Firing shall be permitted only after the proper precautions have been taken for the protection of all persons, work, and property.

B. The following limits on peak particle velocities and air blast overpressure, or such

lower limits as established by the **Contractor's** Blasting Vibration Consultant, shall apply:

1. At structures and utilities in the vicinity of blasting operations, the peak particle velocity resulting from blasting shall not exceed:

   a. Frequency < 3 Hz: 0.2 inches/second.
   b. Frequency 3 - 10 Hz: 0.5 inches/second.
   c. Frequency 10 - 40 Hz: varying linearly 0.5 to 1.0 inches/second.
   d. Frequency > 40 Hz:1.0 inches/second.

   The above limits are adopted from modified blasting level criteria given in U.S. Bureau of Mines Recommendations RI-8507.

2. In the permanent concrete work, the peak particle velocities resulting from blasting shall not exceed 2 inches per second.

3. At the nearest structure subject to damage from air blast overpressure, the mean peak air blast overpressure shall not exceed 0.01 psi. Measure readings for peak particle velocity in three orthogonal directions by equipment approved by the **County** that is either continually recording or triggered by a preset level of vibration. Determine particle velocity in each frequency range by spectral analysis. Zero crossing method to determine frequency is not acceptable.

C. Blasting within 50 feet of permanent concrete work shall be permitted only after approval of the **Contractor's** plans showing the relative positions of the concrete, the area to be blasted, and the blasting technique to be employed. All concrete work shall be protected by limiting the size of blasts, covering blasts, and by other means until it is established that there is no danger of damage caused by either vibration or flying rock.

D. Exercise all possible care in drilling and blasting operations to ensure the stability of the remaining rock and to keep overbreak to a minimum. Written controlled blasting techniques to be used shall be submitted to the **County** for approval.

E. At each work site where blasting is being performed, erect signboards of adequate size stating that blasting operations are taking place in the work site and such signs shall be clearly visible at all points of access to the work site.

F. Monitor the first blast at each location as a test case, and modify the initial blast design for that location if the monitoring record indicates that the vibration and air blast overpressure limits were exceeded or may be exceeded in subsequent blasts. Resubmit the blast design to the **County**. Continue vibration recording and air blast overpressure monitoring for every blast, and further adjustments to the blast design shall be made when the records indicate vibration or air blast overpressure in excess of the established limits.

G. Before the firing of any blast where flying material may result in damage to

persons, property or the work, cover the rock to be blasted with a suitable matting and overburden to prevent flying debris. After a blast is fired, remove all loose and shattered rock or other loose material that may endanger the structure or the workers, and make the excavation safe before continuing with the work. Carry out similar checks on previously excavated sections at least every 48 hours and recheck the support system, tightening lagging and blocking, and adding rock dowels, mesh, and other support measures as required. Before drilling new blast holes, thoroughly clean the face and examine the face for holes containing undetonated explosive.

H. In the event that damage occurs due to blasting work, suspend all blasting immediately and make a report to the **County**. Before resuming blasting, adjust the blast design and resubmit it to the **County**, and take any other appropriate measures to control the effects of blasting.

I. If blasting causes excessive overbreak or excessive fracturing of the surrounding rock, or is otherwise detrimental to the work, modify the blast design as necessary to achieve the desired result, and resubmit it to the **County**.

+++ END OF SECTION 02020 +++

SECTION 02050
DEMOLITION

PART 1 - GENERAL

1.01 SCOPE

A. General:

1. This section covers the labor and materials necessary for the work associated with the demolition or removal of pipes, manholes, catch basins, pavement, houses, and other structures within the construction easements shown on the Plans, including all necessary excavation and backfilling.

2. Where structural tile or brick is removed from existing structures, the work shall include all patching and reconditioning to restore the remaining tile or brick to its existing state and to provide a proper joint for joining the existing to new construction.

3. Where concrete is cut from existing structures under this Section to permit setting or inserting pipes, flumes, equipment, or appurtenances, the work shall include all re-concreting, dressing, and finishing of openings to the required lines and dimensions or as necessary for the placing and fixing of inserts. This repair is to meet all structural and leakage requirements and shall use non-shrink material.

4. The **Contractor** shall remove from existing structures and salvage, store, or dispose of as specified hereinafter, all valves and piping, mechanical equipment, plumbing, heating, electrical, and ventilating fixtures, pipes, ducts, wires, and equipment, doors and windows, floor grating and cover plates, steel stairs, pipe railing, and the like, which are not to remain in service in the finished work, whether or not shown on the Drawings and/or specified herein.

5. The work specified herein and shown on the Drawings is intended to give a general idea of the scope of this work, but shall not be construed as covering it entirely. The **Contractor** shall visit the site and judge the amount of work required and the problems anticipated in the performance of the work.

6. Requirements for removal and abandonment of site utilities are specified in Section 02000.

B. Asbestos Abatement:

1. The **Contractor** shall furnish all labor, materials, facilities, equipment, services, employee training and testing, and waste transportation and disposal for the removal of asbestos-containing materials (ACM) at the

site of the Work. Asbestos could possibly be encountered in demolition of houses, structures, and piping to be demolished.

2. All asbestos removal work shall be performed in accordance with the requirements established by the EPA, OSHA, Georgia Department of Transportation, NIOSH, and State of Georgia EPD regulations; and any other applicable Federal, State, and local regulations governing ACM abatement. Whenever there is a conflict or overlap of the above references, the most stringent provisions shall apply.

3. The **Contractor**, or an asbestos abatement subcontractor acceptable to the **County**, shall be licensed in Georgia to perform asbestos abatement and meet other qualification requirements specified in this Section. The **Contractor** shall include a program for protective equipment, breathing apparatus, work area security, and all other aspects dealing with health and safety in the Health, Safety, and Security Plan. This information may be called for elsewhere in these Specifications; regardless, a submittal shall be required.

C. Related Work Specified Elsewhere:

1. Section 01210 - Measurement and Payment
2. Section 02000 - Site Work

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 Submittals. In addition, the following specific information shall be provided:

1. The **Contractor** shall submit to the **County** a schedule of demolition, detailed methods of demolition to be used for each structure, copies of authorization, and permits to demolish the structures.

PART 2 - PRODUCTS

2.01 GENERAL

A. The **Contractor** shall provide all materials and equipment in suitable and adequate quantities as required to accomplish demolition work.

PART 3 - EXECUTION

3.01 SAFETY REQUIREMENTS

A. All work shall be performed in conformance with the laws and regulations pertaining to safety established by Federal, State, and local governments and other authorities having jurisdiction.

3.02 UTILITIES

A. The **Contractor** shall be responsible for maintaining all appropriate utility services during the demolition operations.

B. Sewer lines shall be removed or grouted for their entire lengths, and plugged at both ends with concrete to prevent groundwater infiltrating into the sewer line.

C. Total shutdown of the existing utilities to perform any new construction, to make the required structural or piping modifications, and/or to make or install the required service or system modifications, will not be permitted, except by written request and approval of the **County**.

D. Prior to making any piping or connections or modifications to existing facilities, the **Contractor** shall obtain specified timing and schedule approval from the **County**.

3.03 EQUIPMENT TO BE SALVAGED BY THE COUNTY

A. The following is a partial list of materials to be removed and salvaged. The **County** will identify other materials to be salvaged during the course of the Work. Equipment on this list shall be removed by the **Contractor** before the demolition work begins and delivered to a site specified by the **County**.

1. Frames, Grates, and Manhole Covers
2. Fire Hydrants
3. Valves
4. Pumps
5. Meters
6. Backflow Devices

3.04 REMOVAL AND STORAGE OF EQUIPMENT FOR REUSE

A. No structure shall be removed without the approval and consent of the **County** unless shown on the Plans to be removed. The **Contractor** shall maintain all equipment in the same condition as when it was removed. The condition of the structure shall be determined prior to removal by the **County**. The **Contractor** assumes the responsibility for ensuring that the material is properly stored and maintained.

3.05 DEMOLITION

A. The Plans define the portion of the structures to be removed. Unless otherwise shown on the Plans, the **Contractor** shall not make rough cuts or breaks that exceed the limits of demolition shown.

B. All equipment, materials, and piping, except as specified hereinbefore, within the limits of the demolition shall become the property of the **Contractor**.

3.06 REMOVAL OF EXISTING PIPING

A. Where existing piping is in conflict with new piping or construction, rerouting or redesign shall be as directed by the **County**.

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. The **Contractor** shall provide all services to perform the work as follows:

1. Remove ACM as required by applicable codes and regulations.

2. Isolate each work area and erect temporary staging, containment barriers, and decontamination facilities as required.

3. Remove all ACM from the work area.

4. Thoroughly clean each work area and perform clearance air testing using NIOSH Method 7400.

5. Remove all temporary staging, partitions, and other items installed to perform the work.

6. Dispose of ACM in accordance with applicable Federal, State, and local laws and regulations.

3.08 BACKFILLING

A. The **Contractor** shall backfill all demolished areas to existing ground level so as to create positive sheet runoff.

B. Backfill material shall meet the requirements of Section 02315 - Excavation and Backfill, as applicable. Backfill compaction shall be in accordance with the applicable requirements of Section 02324 – Trenching and Trench Backfilling and Section Structures. Rock and debris shall not be used as backfill material. In all areas not backfilled to ground level, the **Contractor** shall erect safety barriers around the excavation and not allow water to accumulate.

3.09 DISPOSAL OF DEMOLITION DEBRIS

A. The **Contractor** shall dispose of demolition debris in accordance with the requirements of Section 02000 - Site Work.

+++ END OF SECTION 02050 +++

SECTION 02060
CRUSHED STONE AGGREGATE

PART 1 - GENERAL

1.01 SCOPE

A. This section covers installation of crushed stone aggregate, and any other similar, incidental, or appurtenant operation that may be necessary to properly complete the Work.

B. The **Contractor** shall provide all services, labor, materials, and equipment required for all installation of crushed stone aggregate and related operations necessary or convenient to the **Contractor** for furnishing complete Work as shown on the Plans or specified in these Contract Documents.

C. Related Work Specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 02315 - Excavation and Backfill for Structures
3. Section 02324 - Trenching and Trench Backfilling
4. Section 02700 - Pavement Repairs
5. Section 02920 - Site Restoration
6. Section 03300 - Cast-In-Place Concrete

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300.

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or in these specifications.

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in) Drop.
3. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

6. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

7. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Coarse aggregate shall be crushed stone of a quality equal to the best Stone Mountain Granite, of solid composition, free from dirt and adherent coatings, and suited for the class of its intended usage.

B. Unless otherwise specified elsewhere in these Specifications or directed by the **County**, gradation of coarse aggregate shall conform to size Number 467, Number 57, or Number 67 as described in ASTM C33.

C. The nominal maximum size of coarse aggregate used in concrete shall not be larger than one-fifth (1/5) of the narrowest dimension between sides of the forms, one-third (1/3) of the depth of slabs, or three-fourths (3/4) of the minimum clear spacing between reinforcing bars as described in ACI 68-50.

D. Sand shall be clean and sharp, free from all deleterious substances, and shall conform to the requirements of ASTM C33.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The **Contractor** shall verify that subgrade has been inspected and that gradients and elevations are correct and dry.

3.02 AGGREGATE PLACEMENT

A. The **Contractor** shall place coarse aggregates in areas shown on the Plans or directed by the **County**.

B. The **Contractor** shall place and compact coarse aggregate in accordance with the requirements of Section 02315 - Excavation and Backfill for Structures and Section 02324 - Trenching and Trench Backfilling.

C. The **Contractor** shall level and contour surfaces to elevations and gradients indicated on the Plans.

D. The **Contractor** shall add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. The **Contractor** shall add water to assist compaction. If excess water is apparent, the **Contractor** shall remove aggregate and aerate to reduce moisture content.

F. The **Contractor** shall use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.03 TOLERANCES

A. Flatness: Maximum variation of one-quarter (¼) inch measured with a ten (10)-foot straight edge.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation from True Elevation: Within ½ inch.

D. Base: Compacted to ninety-five percent (95%) modified proctor density as determined by ASTM D1557.

+++ END OF SECTION 02060 +++

SECTION 02110
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals required for all clearing and grubbing including, but not limited to, the removal from the Site of trees, stumps, roots, brush, structures, abandoned utilities, trash, debris, and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated.

B. The extent of route clearing is that minimum degree of clearing necessary to carry out all construction activities, including construction of appurtenances and other additional clearing needed for access purposes. The route clearing shall not exceed the easement, temporary easement, or the signed right of entry agreement.

C. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion control requirements.

D. Clearing operations include, but are not limited to, the following:

1. Protection of existing trees and other vegetation
2. Removal of trees and other vegetation
3. Clearing
4. Removing above-grade improvements
5. Removing underground improvements
6. Restoring damaged improvements
7. Protecting above-grade and underground improvements
8. Erosion control of disturbed areas

E. Related Work Specified Elsewhere:

1. Division 1, General Requirements
2. Section 02125, Temporary and Permanent Erosion and Sediment Control
2. Section 02050, Demolition
4. Section 02200, Earthwork

1.02 JOB CONDITIONS

A. Protection of Existing Improvements:

1. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing improvements.

2. Protect improvements on adjoining properties as well as those on the project site. Restore improvements damaged by this work to their original condition, as acceptable to the **County**. Replace property line monuments (such as iron pins) removed or disturbed by clearing operations under the direction of a Land Surveyor licensed in the State of

Georgia. A submittal is required with data showing the survey and sealed by the licensed land surveyor.

B. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation to avoid cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip lines, foot or vehicular traffic, and parking of vehicles or equipment within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation that will be left standing.

2. Provide protection for tree roots over 1-1/2 inches in diameter that are cut during any construction operation. Coat the cut faces with emulsified asphalt or other acceptable coating that has ben specially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed tree roots with wet burlap to prevent roots from drying out; provide earth cover as soon as possible.

3. Repair or replace damaged trees and vegetation resulting from any construction operation in a manner acceptable to the **County**. Perform tree damage repair at no cost to the **County** by a qualified arborist approved by the **County**. Replace damaged trees that cannot be repaired and restored to full-growth status, as determined by the **County**.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXISTING TREES AND VEGETATION

A. Avoid cutting or injuring trees and vegetation outside easement line and outside areas to be cleared. The **Contractor** shall be responsible for damages outside these lines.

3.02 CLEARING AND GRUBBING

A. Clearing operations shall begin no more than 7 days before beginning construction work for any area.

B. Materials to be cleared, grubbed and removed from the project site include but are not limited to vegetation, trees, stumps, roots, lawns, shrubbery, gardens, paving, miscellaneous structures, debris, and abandoned utilities to the minimum practicable extent to complete the work. Limit clearing to a single lane work route without provision for construction vehicles to pass utility operation. Determine and stake limitations of construction easement or right-of-way prior to commencement of work and keep construction activity within such limits.

C. Grubbing shall consist of completely removing roots, stumps, trash and other debris from all areas to be graded so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.

D. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Stumps and roots larger than 1 inch shall be grubbed and removed to a depth not less than 4 feet below grade. All holes or cavities that extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadway subgrade or two feet below finish grade, whichever is lower.

E. Landscaping features shall include, but are not necessarily limited to: fences, cultivated trees, cultivated shrubbery, property corners, man made improvements, subdivision and other signs shall be moved off the easement. The **Contractor** shall take extreme care in moving landscape features and shall reestablish these features as directed by the **County.**

F. Surface rocks and boulders shall be grubbed from the soil and removed from the site or used as fill in accordance with Section 02200, Earthwork.

G. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

H. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

I. All fences adjoining any excavation or embankment that, in the **Contractor's** opinion, may be damaged or buried, shall be carefully removed, stored and replaced. Any fencing that is damaged shall be replaced with new fence material of equal or better quality and construction. The contractor shall be responsible for the new fence material cost if the **County** deems the contractor was negligent.

J. Stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities that extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material

K. Burying or burning of residual materials and organics shall not be allowed.

L. The **Contractor** shall utilize special precautions required for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the construction area but not directly within excavation and/or fill limits. The Contractor shall be responsible for repair or replacement of any items damaged as a result of its operations.

M. Remove lawn sod by cutting into maximum size which can be handled without tearing, stripping sod and underlying topsoil, and stockpiling for use in restoring the surface area. Water sod and otherwise maintain sod in viable, growing condition. Alternative means of lawn sod replacement may be approved by the **County**.

N. Remove above-grade structures only where shown on the Drawings or as authorized by the **County**.

3.02 HOLES AND DEPRESSIONS

A. Fill holes, depressions and voids created or exposed by clearing operations with non-organic soil material approved by the **County**, unless further excavation or earthwork is indicated.

B. Place fill material in horizontal layers not exceeding six inches loose-depth and compact to a 95 percent standard Proctor.

3.03 DISPOSAL OF WASTE MATERIALS

A. Disposal General Requirements: Dispose cleared matter daily so as to maintain site in a safe and neat condition throughout the contract period. Owners of the property may remove merchantable timber, buildings or other items from the work site before the **Contractor** begins operations, and no assurance exists that any such material will be on the work site when the **Contractor** begins work.

B. On-Site Disposal:

1. When authorized by the **County**, cut tree trunks and limbs, over two inches in diameter, into 48-inch lengths and neatly stack within work limits on the same property as that on which the tree originally grew.

2. On undeveloped property, distribute brush, trees and limbs less than two inches in diameter, within the work area from which cut, as directed by the **County**. On developed property, remove all such clearing waste and properly dispose of it off-site.

C. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the **Contractor** and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall any material or debris be left on the project site, shoved onto abutting private properties, or buried on the project site.

3.04 CONSTRUCTION ACCESS ROUTE ON EASEMENT

A. When shown on the Drawings or directed by the **County**, a construction access route shall be built on the sewer easement for the purpose of accessing manholes and performing all other necessary work within the easement.

B. The Construction access route shall be cut (10) ten feet wide, minimum, and (6) six inches deep below existing grade. Filter fabric shall be placed at the bottom of the cut, and surge stone shall be placed on top of the fabric, filling the 6-inch depth along the roadway.

C. The filter fabric for use under the stone shall be as specified in Section 02125.

D. Surge stone shall be 4” to 6” size (4X6) rip rap type stone, or equivalent. Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Stones shall have less than 66 percent wear when tested in accordance with

AASHTO T-96.

3.06 TREE REMOVAL ON EASEMENTS

A. The contractor shall confirm ownership of all on-site trees within the easement before work commences and submit a tree removal and disposal plan to the **County**.

B. The **County's** written approval shall be obtained prior to the removal of any trees from the easement.

C. All trees that need further processing (wood chips) on-site or disposal off-site must be processed or disposed of in conformance with Federal, State, and local rules and regulations.

D. The **Contractor** must acquire any additional permits prior to commencement of any type of work done in the easement

E. As necessary, stemmed vegetation, such as brush, shrubs, and trees shall be removed at or near the ground level, leaving the root systems intact.

F. Trees shall be felled into the cleared construction area or areas to be cleared and not onto vegetation that will be preserved.

G. Trees that have fallen into water bodies, or beyond the construction area, shall be removed immediately. All damage and remediation costs shall be the **Contractor's** responsibility.

+++ END OF SECTION 02110 +++

SECTION 02112
Route Clearing

PART 1 – GENERAL

1.01 SCOPE

A. The extent of route clearing shall be that minimum degree of clearing necessary to carry out construction activities such as pipe bursting, pipe repairs, and other pipeline renewal processes, including construction of appurtenances, as well as other additional clearing needed for access purposes. The route clearing shall not exceed the easement, temporary easement, or the signed right-of-entry agreement.

B. The **Contractor** shall endeavor to minimize disruption to the neighborhood and shall adjust route-clearing plans to avoid important landscaping features where practicable.

C. Route clearing operations include, but are not limited to, the following:

1. Protecting existing trees and other vegetation
2. Removing trees and other vegetation
3. Clearing
4. Removing above-grade improvements
5. Removing underground improvements
6. Restoring damaged improvements
7. Protecting above-grade and underground improvements
8. Controlling erosion in disturbed areas

1.02 QUALITY ASSURANCE

A. The **Contractor** shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the **Contractor**.

B. Burning of cleared or any other materials on site is not permitted. The **Contractor** shall allow in rates for complete removal of all material arising from any necessary clearing and grubbing.

1.03 JOB CONDITIONS

A. Protection of Existing Improvements:

1. Provide barricades, coverings, or other types of protection necessary to prevent unnecessary damage to existing improvements.

2. Protect improvements on adjoining properties as well as those on the project site. Restore improvements damaged by this work to their original condition, as acceptable to the Owners or other parties or authorities having jurisdiction. Replace property line monuments (such as iron pins) removed or disturbed by clearing operations. This work shall be performed by a Land Surveyor licensed in the State of Georgia. A submittal is required with data showing the survey and sealed by the licensed land surveyor.

B. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip lines, exposing roots to excess foot or vehicular traffic, or parking of vehicles or equipment within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation that will be left standing.

2. Provide protection for tree roots over 1-1/2 inches in diameter that are cut during any construction operation. Coat the cut faces with emulsified asphalt or other acceptable coating, specially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots of trees with wet burlap to prevent roots from drying out; provide earth cover as soon as possible.

3. Repair or replace unnecessarily damaged trees and vegetation, as determined by the **County**, resulting from any construction operation, in a manner acceptable to the property owner and the **County** at the **Contractor's** expense. A qualified nurseryman shall perform tree damage repair. Replace unnecessarily damaged trees that cannot be repaired and restored to full-growth status, as determined by the tree surgeon.

C. Protection of Adjacent Property:

1. Protect improvements, trees, and vegetation on adjoining property as well as those on property requiring route-clearing work.

2. Execute work so as not to create a nuisance to any person, including persons utilizing adjacent property.

3. Use work methods and provide temporary facilities as necessary to prevent washing, erosion, siltation or dust damage, or hazard to persons and property, within and off the work area.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. The **Contractor** shall furnish equipment of the type normally used in clearing and grubbing operations, including, but not limited to, tractors, trucks, loaders, mowers, and clippers.

PART 3 – EXECUTION

3.01 CLEARING

A. Route clearing operations shall begin no more than 7 days before beginning construction work for any area.

B. Materials to be cleared, grubbed, and removed from the project site include, but are not limited to vegetation, trees, stumps, roots, lawns, shrubbery, gardens, paving, miscellaneous structures, debris, and abandoned utilities to the minimum practicable extent to complete the work. Limit clearing to a single-lane work route without provision for construction vehicles to pass utility operation. Accurately determine limitations of the construction easement or right-of-way, and keep construction activity within such limits.

C. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil shall be left sufficiently clean so that further picking and raking will not be required.

D. All stumps, roots, foundations, and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of 2 feet below the limits of excavation for structures, trenches and roadways or 2 feet below finish grade, whichever is lower.

E. Landscaping features shall include, but are not necessarily limited to: fences, cultivated trees, and cultivated shrubbery. Property corners, manmade improvements, and subdivision and other signs shall be moved off the easement. The **Contractor** shall take extreme care in moving landscape features and shall reestablish these features as directed by the **County**.

F. Surface rocks and boulders shall be grubbed from the soil and removed from the site if not suitable as rip rap.

G. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

H. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

I. All fences adjoining any excavation or embankment that, in the **Contractor's** opinion, may be damaged or buried, shall be carefully removed, stored, and replaced. Any fencing that, in the **County's** opinion, is significantly damaged shall be replaced with new fence material of equal or better quality and construction. The **Contractor** shall be responsible for the cost of the new fence material if the **County** deems the contractor was negligent

J. Stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities that extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material.

K. The **Contractor** shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the limits of any temporary easements, but not directly within the permanent easements. The **Contractor** shall be held liable for any damage the **Contractor's** operations have inflicted on such property.

L. The **Contractor** shall be responsible for all damages to existing improvements outside the permanent easement resulting from Contractor's operations.

M. Remove lawn sod by cutting into the maximum size that can be handled without tearing or stripping sod and the underlying topsoil. Store it for use in restoring the surface area. Water the sod and otherwise maintain it in viable, growing condition. Alternative means of lawn sod replacement may be considered by the **County**.

N. Remove above-grade structures only where specifically authorized.

O. Remove conflicting fences and provide effective, temporary measures to prevent domestic animals from wandering to other lands. Reconstruct fences promptly.

P. Remove abandoned underground facilities such as utilities and structures, walls, footings, basements, wells, septic tanks, cisterns, underground pipe, and other items that conflict with construction.

3.02 HOLES AND DEPRESSIONS

A. Fill holes, depressions, and voids created or exposed by clearing operations with non-organic soil material, unless further excavation or earthwork is indicated.

B. Place fill material in horizontal layers not exceeding 6 inches loose-depth and thoroughly compact to a density at least equal to the adjacent original ground.

3.03 DISPOSAL OF WASTE MATERIALS

A. Disposal General Requirements: Accomplish disposal of cleared matter daily so as to maintain site in a safe and neat condition throughout the contract period. Owners of the property may remove marketable timber, buildings or other items of value from the work site before the **Contractor** begins operations, and no

assurance exists that any such material will be on the work site when the **Contractor** begins work.

B. On-Site Disposal:

1. Unless a property owner requests complete removal, cut tree trunks and limbs, over 2 inches in diameter, into 48-inch lengths and neatly stack within work limits having the same property ownership as that on which the tree originally grew.

2. On undeveloped property, distribute brush, trees, and limbs less than 2 inches in diameter, within the work area from which cut, in such a way as not to be objectionable to the property owner. On developed property, remove all such clearing waste and properly dispose of it off-site.

3.04 DISPOSAL OF DEBRIS

A. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the **Contractor** and shall be disposed of in accordance with all requirements of federal, state, county, and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner with an approved permit from the **County**. In no case shall any material or debris of any kind be left on the Project, shoved onto abutting private properties, or buried on the Project.

3.05 CONSTRUCTION ACCESS ROUTE ON EASEMENT

A. When directed by the **County**, a construction access route shall be built on the sewer easement for the purpose of accessing manholes and performing all other necessary work within the easement.

B. Construction access route shall be cut a minimum of 10 feet wide and 6 inches deep below existing grade. Filter fabric shall be placed at the bottom of the cut, and surge stone shall be placed on top of the fabric, filling the 6-inch depth along the roadway.

C. The filter fabric for use under the stone shall be as specified in Section 02125.

D. Surge stone shall be 4X6 rip rap type stone, or equivalent. The **Contractor** shall use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Stones shall have less than 66 percent wear when tested in accordance with AASHTO T-96.

3.06 TREE REMOVAL ON EASEMENTS

A. The **Contractor** shall confirm ownership of all on-site trees within the easement before work commences and submit a tree removal plan to the **County**.

B. The **County's** approval shall be obtained prior to the removal of any trees from the easement such concurrence shall be obtained in writing.

C. The approval of the **County** concerning the method and location of disposal of materials shall be obtained before work commences.

D. All trees that need further processing (wood chips) on-site or disposal off-site must be processed or disposed of in conformance with Federal, State, and local rules and regulations.

E. The **Contractor** shall ensure all utilities are located prior to the commencement of any clearing or construction work in the easement.

F. The **Contractor** shall acquire any necessary permits prior to commencement of any type of work done in the easement especially for the removal of trees and crossing of waterways.

G. Stemmed vegetation such as brush, shrubs, and trees as necessary shall be removed at or near the ground level, leaving the root systems intact.

H. Trees shall be felled into the cleared construction area or areas to be cleared and not onto vegetation to be preserved.

I. Trees that have fallen into water bodies, or beyond the construction area, shall be removed immediately. All damage and remediation costs shall be the **Contractor's**.

+++ END OF SECTION 02112 +++

SECTION 02125
TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section includes requirements for the provision, maintenance, and subsequent removal of temporary and/or permanent erosion and sediment controls as shown on the approved plans.

B. The temporary erosion and sediment controls contained herein shall be coordinated with the permanent erosion controls, to assure economical, effective, and continuous erosion and sediment control during construction within acceptable limits. Acceptable limits are as established by the Georgia Erosion and Sedimentation Control Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations, and laws of local and municipal authorities having jurisdiction.

C. Land disturbance activities shall not commence until the Land Disturbance Permit Stream Buffer variance and Notice of Intent, if applicable, have been properly issued and all required meetings have taken place.

D. This section includes the design of project specific devices and practices to meet requirements of the related work and references listed below in conjunction with the **Contractor's** own means, methods, and techniques, schedules and sequences of work, and actual conditions encountered. Design shall be performed by professionals experienced and familiar with stormwater and drainage characteristics as well as the requirements of references listed below.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Erosion and Sediment Control Plan
B. Section 02485 - Seeding
C. Section 02486 – Sodding
D. Section 02490 – Trees, Shrubs, and Groundcovers
E. Section 02750 – Bypass Pumping

1.03 REFERENCES

A. DeKalb County Soil Erosion and Sedimentation Control Ordinance
B. DeKalb County Comprehensive Stormwater Management and Stormwater Quality Ordinance
C. Manual for Erosion and Sediment Control in Georgia, as published by the Georgia Soil and Water Conservation Commission (current edition)
D. Federal Clean Water Act
E. Georgia Erosion and Sedimentation Act of 1975, as amended.
F. Georgia Department of Natural Resources, Environmental Protection Division General NPDES Permit # 100002

1.04 QUALITY ASSURANCE

A. The **Contractor** shall provide at least one representative involved in the project's land disturbing activities that has successfully completed the erosion and sediment control education and certification program as administered by the Georgia Soil and Water Conservation Commission; this "certified person" shall have completed as a minimum, the Level 1A (Fundamentals) course. A "certified person" shall be present onsite **at all times** when work is being performed. Failure to maintain a certified person onsite at all times may result in a stop work order or other appropriate enforcement action.

1.05 SUBMITTALS

A. Within fifteen (15) days after the date of the Notice to Proceed, the **Contractor** shall submit a narrative description, working drawings and schedule for proposed temporary erosion and sedimentation controls to the local authority and Engineer for approval. The description and working drawings shall meet the requirements of the Georgia Erosion and Sedimentation Act of 1975 (as amended) and local soil erosion and sedimentation control ordinances. All fines imposed for improper erosion and sedimentation control shall be paid by the **Contractor**.

B. Land disturbance activity shall not commence until the erosion and sedimentation control plans are approved. The Engineer will provide a reproducible drawing of plan sheets to the **Contractor** for **Contractor's** use if necessary. The reproducible drawing will not bear the Engineer's seal or logo and is provided only for the **Contractor's** convenience in obtaining land disturbance permits.

C. The description and working drawings shall indicate controls that will minimize erosion and prevent the off-site transport of sediment in stormwater and drainage from the jobsite areas.

D. The **Contractor** shall submit a written plan to the Engineer for both temporary and permanent grassing. The plan shall include selection of species, dates, and rates of application for seeding, fertilizer, and mulching.

E. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 of these Specifications. Unless otherwise noted, all submittals shall be produced at the Pre-Construction Meeting. In addition, the following information shall be submitted to the **County**.

   a. Certification credentials of all persons that have completed the Georgia Soil and Water Conservation Commission's erosion and sediment control education and certification program and that will be involved in the project shall be provided to the **County** prior to the start of any land disturbing activities.

PART 2 – PRACTICES AND PRODUCTS

2.01 GENERAL

A. The following paragraphs generally describe the erosion and sediment control practices and products typically employed on a utility construction project. The detailed requirements for these, as well as for other measures that may be needed to achieve effective erosion control, shall be as specified in the Standards and Specifications for General Land Disturbing Activities of the Manual for Erosion and Sediment Control in Georgia.

B. The paragraph titles and alphanumeric codes refer to specific structural and vegetative type practices included in the aforementioned Standards. All practices shall be considered temporary erosion and sediment control features, except the channel stabilization, gabions and grassing/sodding, trees, shrubs, and groundcovers, which are considered permanent measures.

2.02 STRUCTURAL PRACTICES

A. CONSTRUCTION EXIT - Co

1. A construction exit consists of a stone-stabilized pad with a geotextile underliner located at any point where traffic will be leaving a construction site to a public right-of-way, street, alley, sidewalk, or parking area.

2. Construction exits are used to reduce or eliminate transport of mud from the construction area.

3. Construction exits shall consist of graded 1.5- to 3.5-inch stone meeting National Stone Association grade R-2. The geotextile underliner shall be a non-woven fabric equal to No. C-45NW as manufactured by Contech Construction Products, Inc. or equal.

B. CHANNEL STABILIZATION (RIP RAP) - Ch

1. Channel stabilization consists of structures to stabilize an open channel for water conveyance. Such stabilization is typically applied in these locations where the channel banks and bed have been disturbed by excavation for a pipeline crossing.

2. Channels shall be stabilized using a rock rip rap lining. The lining shall consist of filter bedding stone and graded rip rap stone. Sizes of stone shall be as classified by either the National Stone Association (N.S.A.) or the Department of Transportation (D.O.T.). Rip rap stone shall be equal to Georgia Department of Transportation Type 1 or Type 3. Filter bedding stone shall be graded stone not exceeding 6 inches in diameter. An appropriate geotextile fabric may be substituted for filter stone.

C. GABIONS – Ga

Gabions are large, multi-celled mesh boxes used in channel revetments,

retaining walls, abutments, check dams, etc. Boxes shall be constructed of PVC coated wire mesh and filled with 4-inch to 8-inch pieces of durable stone. Stone placement shall be principally by hand or gentle mechanical dumping in no more than 12-inch layers with PVC coated wire cross and diagonal supports in each cell to retain and support basket sides at those intervals. Minimum size for box gabions shall be 6'-0" x 3'-0" x 3'-0". Minimum size for reno mattresses shall be 9'-9" x 6'-6" x 0'-9". Gabions shall be manufactured by Macaferri or equal.

D. TEMPORARY STREAM CROSSING - Sr

1. A temporary stream crossing is a structure installed across a flowing stream for use by construction equipment.

2. Structures may include bridges, round pipes, and pipe arches. The structure shall be large enough to convey the full bank flow of the stream and be designed by the **Contractor** to withstand flows from a 2-year, 24-hour frequency storm.

E. CHECK DAMS - Cd

1. Check dams are barriers composed of stone or haybales placed across a natural or constructed drainageway to prevent erosion in areas of concentrated flows.

2. Stone check dams shall not be utilized where the drainage area exceeds five acres. Haybale check dams shall not be used where drainage areas exceed 2 acres. Check dams shall not be installed in live streams.

3. Stone check dams should be constructed of graded size 2- to 10-inch stone.

F. SEDIMENT BARRIER

1. STAKED HAYBALES - Sd1

a. Haybale barriers are placed in a single row on natural ground where the most likely erodible areas are located to restrain sediment particles carried by sheet flow.

2. SILT FENCE - Sd1

a. Silt fences are temporary measures to retain suspended silt particles carried by sheet flow.

b. Silt fence consists of silt fabric, as specified in the Georgia Department of Transportation list #36, wood or steel posts, and wire or nail fasteners.

c. Type A silt fence is a non-woven 36-inch wide filter fabric and shall be used on developments where the life of the project is greater than or equal to six (6) months. The flow rate (gallon/minute/square

foot) is 25. Additionally, Type A fabric has a color mark.

d. Type C silt fence is a woven 36-inch-wide filter fabric with wire reinforcement. The wire reinforcement is necessary because this fabric allows almost three times the flow rate as Type A silt fence. The flow rate (gallon/minute/square foot) is 70. Additionally, Type C fabric does not have a color mark.

G. INLET SEDIMENT TRAP - Sd2

1. Inlet sediment traps are temporarily protective devices formed around a storm drain inlet to trap sediment.

2. Inlet sediment traps are used to prevent sediment from leaving a site or from entering storm drain systems prior to permanent stabilization of the disturbed area.

H. ROCK FILTER DAM - Rd

1. Rock filter dams are installed across small non-actively flowing drainageways and are applicable for projects that involve grading activity directly in those drainageways.

2. Rock filter dams consist of rip rap faced with smaller rock on the upstream side for additional filtering affect.

I. STREAM DIVERSION - PIPED DIVERSION (DV1), PUMPED DIVERSION (DV2), ENGINEERED DIVERSION STRUCTURES (DV3))

1. Installation of water and sewer pipelines designed to cross natural streams shall be accomplished only in “dry channel” conditions (i.e., in the absence of stream flow in the work area). Provisions shall be implemented to divert a constant quantity and quality of stream waters around the construction area by means of adequately sized pipes, pumps, or engineered diversion structures or other methods proposed by the **Contractor** and approved by the **County**. These diversion devices will be maintained throughout the duration of construction within the stream channel. The structures shall be designed by professionals familiar with stormwater / drainage characteristics and applicable requirements to withstand flows from a 2-year, 24-hour frequency storm event unless otherwise noted on the drawings. Stream diversion devices shall not be removed until all disturbed areas of the stream channel bottom and banks are returned to original contours and stabilized to prevent erosion. The planning, scheduling, and sequencing of work by the **Contractor** shall be described in a detailed submittal to the **County** for approval. The final implementation schedule will only be determined in conjunction with forecasted weather conditions for the period anticipated for diversion.

a. Piped Diversion - Dv1
Piped diversions shall be installed and implemented in conjunction

with and as an extension of Temporary Stream Crossings - (Sr). Pipes shall be sized as shown on the drawings with sufficient coordination and planning as to their locations, elevations, etc. to allow subsequent water/sewer pipeline construction to occur in "dry channel' conditions.

Necessary sandbags or other sealing devices, dewatering, etc. shall be provided to accomplish this piped diversion as well as other "Best Management Practices" to ensure that erosion and sedimentation is controlled.

b. Pumped Diversion - Dv2

Pumped diversions shall be installed and implemented in conjunction with and as an extension of Temporary Stream Crossings - (Sr). Pumps and piping shall be sized as shown on the drawings with sufficient coordination and planning as to their locations, elevations, etc. to allow subsequent water/sewer pipeline construction to occur in "dry channel" conditions.

Necessary sandbags or other sealing devices, dewatering, discharge sediment basins, sediment filter socks, "floc logs," "dirt bags", etc. shall be provided to accomplish this pumped diversion as well as other "Best Management Practices" to ensure that erosion and sedimentation is controlled.

c. Engineered Diversion Structure - Dv3

Engineered diversion structures such as "Aqua Barrier", "Portadam," interlocked sheet piling, rip-rap cofferdams, etc. shall be installed and implemented to allow subsequent water/sewer pipeline construction to occur in "dry channel" conditions. Sequential work elements may be involved to allow the construction area to progress across a stream, and ensuring that the previously completed segment is reasonably restored and stabilized.

Necessary sandbags, geotextiles, linings, or other sealing devices, dewatering, etc, shall be provided to accomplish this manner of diversion as well as other "Best Management Practices" to ensure that erosion and sedimentation is controlled.

2.03 - VEGETATIVE PRACTICES

A. GENERAL

1. Disturbed areas shall be stabilized as construction progresses. For sanitary sewers or water mains installed within easements, the construction corridor shall not exceed 1,000 linear feet without stabilization. All other projects shall not exceed 300 linear feet without stabilization.

B. DISTURBED AREA STABILIZATION (WITH MULCHING ONLY) - Ds1

1. This practice is applicable where disturbed areas, temporarily idle, have not been established to final grade and/or where permanent vegetative cover is delayed for a period not to exceed 6 months.

2. Mulch materials shall consist of dry straw or hay, wood chips, erosion control matting or netting, or polyethylene film. The mulch should be uniform, spread over the designated area from 2 to 4 inches thick.

3. Any and all disturbed areas that have not yet reached final grade shall be stabilized with mulch or temporary grassing within 14 calendar days of disturbance.

C. DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING) - Ds2

1. Temporary seeding is a measure consisting of seeding and mulching to reduce erosion. All disturbed areas shall be seeded when and where necessary to reduce erosion.

2. This practice is applicable where disturbed areas, temporarily idle, have not been established to final grade and/or where permanent vegetative cover is delayed for up to 6 months.

3. Temporary seeding consists of a grass or grass-legume mixture suitable to the area and season of the year.

D. DISTURBED AREA STABILIZATION (WITH PERMANENT VEGETATION) - Ds3

See Section 02485 – Seeding
See Section 02486 – Sodding
See Section 02490 – Trees, Shrubs, and Groundcovers

1. Permanent (perennial) vegetation shall consist of planted grasses, trees, shrubs, and/or perennial vines; a crop of perennial vegetation appropriate for the time of year and region (or to match, in kind, pre-existing maintained vegetation); or a crop of annual vegetation and seeding of target crop perennials appropriate for the region (or to match, in kind, pre-existing maintained vegetation), such that within the growing season a 70 percent coverage by perennial vegetation shall be achieved.

2. This practice is applicable on disturbed areas at final grade.

3. Permanent perennial vegetation shall be applied on rough graded areas that will be undisturbed for more than 6 months.

E. DISTURBED AREA STABILIZATION (WITH SODDING) - Ds4

See Section 02933 – Seeding
See Section 02486 – Sodding

1. This practice shall consist of ground preparation, furnishing lime and fertilizer, and placement of sod.

2. Sod shall be from local area and delivered to the job site in either industry standard blocks or rolls. Sod shall not be delivered to the job site more than 24 hours prior to installation. Sod shall be hand placed with edges butted and cut as required to fit the placement area. The finished installation shall be rolled with a lawn roller and thoroughly watered. The sod will be watered daily for the first five days after installation.

3. Sod shall be anchored on slopes steeper than 3:1.

F. EROSION CONTROL MATTING AND BLANKETS - Mb

1. This practice is a protective covering (blanket) or soil stabilization mat used to stabilize disturbed areas until permanent vegetation on steep slopes, channels, or shorelines can be established.

2. Concentrated flow areas, all slopes steeper than 2.5:1 and with a height of ten feet or greater, and cuts and fills within stream buffers, shall be stabilized with the appropriate erosion control matting or blankets.

3. All blanket and matting materials shall be on the Georgia Department of Transportation Qualified Products List (QPL #62 for Blankets, QPL #49 for Matting).

G. JOINT PLANTING STABILIZATION (rip-rap and willow stakes)
Joint planting is a system that installs live willow stakes between rip-rap (type 3) placed previously along the stream bank. It is installed to increase the effectiveness of the rock system by forming a living root matt in the base upon which rock has been placed and improve the environmental function and aesthetics of the rock bank. The rock shall be principally placed by hand or gentle mechanical dumping. Willow stake density of installation shall be 3 to 5 cuttings per square yard. Cuttings shall be 2 inches in diameter and 3.5 feet in length. The cutting shall be freshly cut and alive. Two thirds of the live stake shall be in the ground below the previously placed rock. Only native species willow stakes shall be used.

PART 3 - EXECUTION

3.01 GENERAL

A. At the Preconstruction Conference, the **Contractor** shall submit a schedule for accomplishing the temporary erosion control work for specific conditions to be encountered on the project.

B. The **Contractor** shall install all erosion and sediment control devices as required by actual field conditions, as shown on the approved plans, or as directed by the **County** or by any agency having jurisdiction in the locale of the project.

C. The erosion and sediment control devices shall be installed by the

Contractor before land disturbing activities begin.

D. The **County** has the authority to direct the **Contractor** to provide immediate, additional temporary erosion control measures to prevent contamination of adjacent waterways and drainage ways. Additional erosion control measures may be used to correct conditions that develop during construction that were not foreseen during the design stage or that are needed prior to installation of the permanent erosion control features.

E. The **County** may limit the area of excavation in progress based on the **Contractor's** capability and progress in keeping the finish grading, mulching, and seeding current, in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures, such as mulching or temporary seeding, shall be taken immediately to the extent feasible and justified.

F. The **Contractor** shall incorporate all permanent erosion control features (grassing and sodding) into the project at the earliest practicable time.

3.02 INSTALLATION

A. Erosion control measures shall be designed by professionals familiar with storm water / drainage characteristics, installed, and maintained in accordance with the "Manual for Erosion and Sediment Control in Georgia" published by the Georgia Soil and Water Conservation Commission.

3.03 INSPECTION

A. Upon completion of installation, the **County** or other local government authority shall inspect the erosion and sediment control devices for proper installation, flaws, defects, or other damage. The **Contractor** shall repair or replace, at its expense, the unacceptable portions, as directed by the **County** or local government authority.

B. All erosion and sediment control devices shall be inspected by the **Contractor** at least weekly and after each rainfall occurrence.

C. All projects that require compliance with General NPDES Permit 100002 guidelines shall have inspections and monitoring in accordance with the specific Comprehensive Monitoring Plan and Section 02275 – Storm Water Discharges of these specifications.

3.04 MAINTENANCE

A. The **Contractor** shall maintain the erosion and sediment control devices until the project is completed and all disturbed areas are stabilized. Maintenance of the devices shall include: removal and disposal of silt accumulation, replacement of damaged or deteriorated devices, other repairs, and the installation of additional

devices should those devices installed prove to be inadequate. The **Contractor** shall provide this maintenance at no additional cost to the **County**.

Silt shall be cleaned out once it has accumulated to 1/2 the height of the device or when 1/2 of the available sediment storage capacity has been attained.

3.05 REMOVAL

A. Temporary erosion and sediment devices shall remain in place until such time as a satisfactory stand of grass has been established, unless the **County** or local government authority directs earlier removal. Damaged or otherwise unusable devices shall be removed from the site and disposed of properly.

B. After erosion and sediment device removal, the **Contractor** shall dress out any disturbed areas in the vicinity of the removed device and grass according to these Specifications.

+++ END OF SECTION 02270 +++

SECTION 02140
DEWATERING

PART 1 - GENERAL

1.01 SCOPE

A. Construct all permanent Work in areas free from water. Design, construct and maintain all dikes, levees, cofferdams and diversion and drainage channels as necessary to maintain the areas free from water and to protect the areas to be occupied by permanent work from water damage. Remove temporary works after they have served their purpose.

B. The **Contractor** shall be responsible for the stability of all temporary and permanent slopes, grades, foundations, materials and structures during the course of the Contract. Repair and replace all slopes, grades, foundations, materials and structures damaged by water, both surface and sub-surface, to the lines, grades and conditions existing prior to the damage at no additional cost to the **County**.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 CARE OF WATER

A. Except where the excavated materials are designated as materials for permanent work, material from required excavation may be used for dikes, levees, cofferdams and other temporary backfill if approved by the **County**.

B. Furnish, install, maintain, and operate necessary pumping and other equipment for dewatering the various parts of the Work and for maintaining the foundation and other parts free from water as required for constructing each part of the Work.

C. Install all drainage ditches, sumps, and pumps to control excessive seepage on excavated slopes, to drain isolated zones with perched water tables, and to drain impervious surfaces at final excavation elevation.

D. After they have served their purpose, remove all temporary protective work at a satisfactory time and in a satisfactory manner. All diversion channels and other temporary excavations in areas where the compacted fill or other structures will be constructed shall be cleaned out, backfilled and processed under the same Specifications as those governing the compacted fill.

E. When the temporary works will not adversely affect any item of permanent work or the planned usage of the Project, the **Contractor** shall receive approval from the **County** to leave such temporary works in place. In such instances, breaching of dikes, levees, and cofferdams may be required.

3.02 DEWATERING

A. By the use of well points, pumps, tile drains, or other approved methods, the **Contractor** shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.

B. As directed by the **County**, excavations shall be continuously dewatered to maintain a groundwater level no higher than 2 feet below the lowest point in the excavation.

C. Piezometric observation wells shall be required to monitor the groundwater level and ensure proper dewatering prior to excavation below the static water table. The number of wells required will vary depending on the size and depth of structures.

D. No separate payment will be made for dewatering required to accomplish the work.

+++ END OF SECTION 02140 +++

SECTION 02200
EARTHWORK

PART 1 – GENERAL

1.01 SCOPE

A. The work under this Section includes earthwork and related operations, including, but not limited to excavating all classes of material encountered; trenching; handling; storage; transportation; and disposal of all excavated and unsuitable material; construction of fills and embankments; backfilling around structures; backfilling all pits; compacting; all sheeting; shoring and bracing; preparation of subgrades; surfacing and grading; and any other similar, incidental, or appurtenant earthwork operation that may be necessary to properly complete the Work.

B. The **Contractor** shall provide all services, labor, materials, and equipment required for all earthwork and related operations necessary or convenient to the **Contractor** for furnishing complete Work as shown on the Drawings or specified in these Contract Documents.

C. Related Work specified elsewhere:

1. Section 02229 – Pipeline Crossings
2. Section 02324 – Trenching and Trench Backfilling

1.02 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best available data and are intended to give reasonable information about the existing elevations. The **Contractor** shall verify conditions to determine the exact quantities of excavation and fill required.

B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions taken against all hazards.

C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained in good condition at all times by the **Contractor** until final acceptance by the **County**. All damages and cost caused by erosion or other construction operations shall be the **Contractor's** responsibility and repaired by the **Contractor** using material of the same type as the damaged material at no cost to the **County**.

D. The **Contractor** shall control grading in a manner to prevent water running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby stormwater can flow uninterrupted in existing open ditches or channels; other surface drains; or temporary drains with the required E&S measures.

E. The soil testing shall be performed by the **Contractor's** testing laboratory. At least one density test shall be performed for every 5,000 square feet of fill area and every 2 feet of fill lift. Extra tests may be required at the **County's** discretion.

F. Should the **County** choose to conduct its own testing, the **Contractor** shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests at no expense to the **County**. The cost of all retests made necessary by the failure of materials supplied by the **Contractor**, its agents or subcontractors, to conform to the requirements of these Contract Documents shall be paid by the **Contractor**. The **Contractor** shall provide at least 24 hours advance notice of earthwork operations to the Testing Laboratory. The Laboratory shall provide reports to the **County** with copies to the **Contractor** certifying (and sealed by a Registered Georgia Engineer) that earthwork is in conformance with the plans and specifications. The Testing laboratory shall witness the placement of all fill, unless otherwise directed by the **County**.

G. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the **County**.

H. Stockpile Areas: Provided there is space available, stockpiling material may be on site if approved by the **County** and protected by E&S measures.

1.03 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. Copies of permits obtained by the **Contractor** for the work.
2. Test results, certification of compliance, source and samples for all imported materials.
3. Samples of fill materials to be used. Samples shall be submitted 2 weeks in advance of use and shall consist of 0.5 cubic feet of each type of material.
4. Test reports for compaction.

1.04 QUALITY ASSURANCE

A. Reference Standards. Comply with all Federal, State and local laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements, including the partial listing below:

1. ASTM C136-84a, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D1556-82, Test Method for Density of Soils in Place by the Sand Cone Method.

3. ASTM D1557-78, Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.5-kg) Rammer and 18-in. (457-mm Drop).
4. ASTM D3107-88, Test Method for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

PART 2 – PRODUCTS

2.01 MATERIALS

A. Earthwork Materials

1. Controlled Fill:

a. Proposed fill soils shall be laboratory tested prior to construction use to determine their suitability. All fill material shall be subject to the approval of the **County**.
b. Notification: For approval of imported fill material, notify the **County** and Testing Laboratory at least 3 weeks in advance of intention to import material, designate the proposed borrow area, and permit the Testing Laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material. Test results shall be submitted to the **County** for approval. All fill shall be free of significant organic matter or debris, have a low to moderate plasticity (PI<15), uniform composition, and be free of rock fragments greater than three inches in dimension. Soils selected for use as fill material shall also have a standard Proctor (ASTM D 698) maximum dry density of at least 90 pounds per cubic foot.
c. All on-site fill material shall be soil free of organic matter, frozen lumps, or other deleterious substances.
d. It shall contain no rocks or earth clumps over 3 inches maximum in dimension. However, the **County** reserves the right to approve larger or smaller sizes for different depths of fill.

2. Structural Fill and Structural Backfill:

a. Select on site materials may be suitable. Testing and recommendation of suitability shall be made by the Testing Laboratory and submitted by the **Contractor** to the **County** for approval.
b. Imported material shall be sand, uniformly graded crushed rock or other select material recommended by the Testing Laboratory and submitted by the **Contractor** to the **County** for approval. Graded aggregate base material, as specified in Section 02700, New and Replacement Pavement, is acceptable for structural fill and backfill.
c. Crushed Rock: Crushed rock used for bedding and drainage stone shall conform to the Georgia Department of Transportation

Standard Specifications for Construction of Road and Bridges, Section 800 for No. 57 Stone.

3. Coarse Aggregate: Coarse aggregate shall conform to the Georgia Department of Transportation Standard Specifications of Transportation Systems construction of Road and Bridges, Section 800 for No. 57 Stone, Group II, and shall have the following gradation:

Sieve size	Percent Passing	
1-½ inch	100	-
1 inch	95	100
¾ inch	-	-
½ inch	25	60
3/8 inch	-	-
#4	0	10
#8	0	5

4. Top Soil: Dark organic weed free loam.

B. Sheeting, Bracing and Timbering: The **Contractor** shall furnish, place, and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures, or utilities outside of the trench or pit.

1. General:

a. All cofferdams, sheeting, bracing and timbering shall be designed, sealed and signed by a registered Professional Engineer in the State of Georgia at the **Contractor's** expense. A copy of the drawings and design computations shall be submitted to the **County** for the project files.

b. Sheeting, bracing and timbering shall be so placed as to allow the Work to be constructed to the lines and grades shown on the Drawings.

c. If at any time the method being used by the **Contractor** for supporting any material or structure in or adjacent to any excavation is not reasonably safe the **County** may require and the **Contractor** shall at their cost provide additional bracing and support necessary to furnish the added degree of safety. The **Contractor** shall provide such added bracing and support by such method as **Contractor** may elect to use, but the taking of such added precautions shall in no way relieve the **Contractor** of sole and final responsibility for the safety of lives, work and structures.

d. All sheeting and shoring in contact with the concrete or masonry shall remain in place. The sheeting or shoring above the structure may remain in place or be cut off at the approval of the **County**. No sheeting shall be left in place within three feet below the ground surface unless it is in contact with the concrete or masonry

e. There shall be no payment for sheeting, bracing, shoring, and timbering left in place.

2. Timber:

a. Timber may be substituted for steel sheet piling when approved by the **County**. Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.

b. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the work and adjacent property. Leave sheeting in place when it cannot be safely removed. Cut off sheeting left in place below the finished ground surface by three feet unless in contact with the concrete or masonry.

3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations. Procedures for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral or vertical movement at all times. In addition to the drawings and computations, the **Contractor** shall provide closure and sealing details between sheet piling and existing facilities, as well as method of excavation within sheet piling to the **County** for review before commencing construction operations. **Contractor** shall be responsible for all damage to existing utilities and structures resulting from installation of sheet piling. Damage to existing utilities and/or structures resulting from installation of sheet piling shall be repaired at the **Contractor's** expense as well as all associated damages.

C. Other Materials: All other materials not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to the prior approval of the **County**.

D. Stockpile area: The stockpile area shown on the drawings, or as directed by the **County**, shall be used to stockpile soil material for backfilling around structures and to stockpile needed topsoil.

PART 3 – EXECUTION

3.01 GENERAL

A. Benching of Slopes: When the embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when the embankment is to be built ½ width at a time, the slopes that are steeper than 4:1, as measured at right angles to the embankment, shall be continuously benched over those areas as the work is brought up in layers. Benching shall be of sufficient width to permit the operation of placing and compacting equipment. Each successive cut shall begin at the intersection of the original ground and the vertical side of the previous cut.

Material thus cut shall be recompacted along with the new embankment material. The **Contractor** shall proof roll subgrade prior to placement of fill material.

B. Topsoil:

1. Remove all topsoil to a depth at which subsoil is encountered, from all areas that are to be cut to lower grades or filled.
2. Topsoil to be used for finish grading may be stored on the site. It shall be piled properly, sloped to drain and covered.

C. Bracing and Sheeting:

1. Furnish, install, and maintain all sheeting, bracing, and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth that could in any way injure the work, adjacent property, or workers.
2. Properly support all trenches for duct bank installation so as to conform to all pertinent rules and regulations and these Specifications. All trenches deeper than OSHA's maximum depth for no shoring shall be shored unless cut to the angle of repose of the excavated soils.
3. Exercise care in the removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.
4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved or instructed by the **County**. The cost of leaving sheeting or bracing shall be at the **Contractor's** expense.
5. All sheeting and shoring in contact with concrete or masonry shall remain in place. The sheeting and shoring above the structure may remain or be cut off. No sheeting or shoring left in place shall be within three feet below the ground surface. Direction from the **County** is required when the sheeting or shoring is in contact with concrete or masonry and within 3 feet below ground surface.

D. Obstructions:

1. Remove and dispose of all trees, stumps, roots, boulders, pavement, pipes, and the like, as required for the performance of the work.
2. Exercise care in excavating around catch basins, inlets, manholes, piping, duct banks, underground vaults, etc.
3. Avoid removing or loosening castings or pushing dirt into structures.
4. Damaged or displaced castings shall be repaired and replaced, and dirt entering the structures or system during the performance of the work shall be removed and cleaned at no additional cost to the **County**.

E. Utilities to be Abandoned:

1. When pipes, conduits, sewers, or other structures are removed from the trench leaving dead ends in the ground, such ends shall be fully plugged and sealed as indicated on the Drawings.

2. Abandoned structures such as manholes, catch basins, or chambers shall be entirely removed and the void properly backfilled unless otherwise specified or indicated on the Drawings.
3. All materials from abandoned utilities that can be readily salvaged shall be removed from the excavation and stored on the site at a location as directed by the **County**.
4. All salvageable materials will remain the property of the **County** unless otherwise indicated by the **County**.

F. Extra Earth Excavation:

1. In case soft material that is not suitable in the opinion of the **County** is encountered in the bottom of a trench or underneath a structure, the soft material shall be removed and replaced with structural fill or coarse aggregate.

G. Cutting Paved Surfaces and Similar Improvements:

1. Remove existing pavement as necessary for installing utilities and appurtenances or as otherwise shown on the Drawings.
2. Before removing any pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks to match the width of the trench.
3. Break asphalt pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
   Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
4. Do not pull pavement with machines until it is completely broken and separated from the pavement that will remain.
5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. Refer to Section 02700 for replacement of damaged or removed pavement.
   NOTE: No additional payment will be made for removing and replacing damaged adjacent pavement if negligence by the Contractor has occurred.
6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
7. The **Contractor** may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

H. Dewatering:

1. The proposed dewatering plan shall be submitted by the **Contractor** to the **County** for approval at least 10 working days prior to the beginning of any excavation.

2. Furnish, install, maintain, and operate necessary pumping and other equipment for dewatering the various parts of the Work and for maintaining the foundation and other parts free from water, as required for constructing each part of the Work.
3. By the use of well points, pumps, tile drains, or other approved methods, the **Contractor** shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.
4. Excavations shall be continuously dewatered to maintain a groundwater level no higher than 3 feet below the lowest point in the excavation.
5. Piezometric observation wells shall be required, to monitor the groundwater level, to ensure proper dewatering prior to excavation below the static water table. The number of wells required will vary depending on the size and depth of structures and shall be included in the plan.
6. The cost for all dewatering and discharge shall be at the **Contractor's** expense and shall be considered incidental.

3.02 EXCAVATION

A. Method:

1. All excavation shall be by open cut from the surface except as indicated on the Drawings.
2. All excavations for appurtenances and structures shall be made in such manner and to such depth and width as will give ample room for building the structures and for bracing, sheeting, and supporting the sides of the excavation, for pumping and draining groundwater and wastewater which may be encountered, and for the removal from the trench of all materials excavated.
3. Water shall not be allowed to accumulate in excavations. The **Contractor** shall provide sufficient temporary pumping to ensure that surface and groundwaters do not saturate foundation soils.
4. Take special care so that soil below the bottom of the structure to be built is left undisturbed.

B. Grades:

1. Excavate to lines and grades indicated on the Drawings.
2. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.

C. Disposal of Excavated Material:

1. Remove and legally dispose of all excavated material not needed to complete filling, backfilling, and grading.
2. Dispose of excess excavated material at locations secured by the Contractor and in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street or alley. No

debris shall be deposited on any private property except by written consent of the property owner with the required **County** permits. In no case shall any material be left on the Project site, or be buried in embankments or trenches on the Project. With recommendation of the Testing Laboratory and approval by the **County**, demolished, crushed concrete may be acceptable for use in fill areas.

3. Excavated materials shall be placed adjacent to the work to be used for backfilling as required.
4. Excavated materials shall be placed, meeting OSHA's minimum distance, sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and to not cause any drainage problem. Excavated material shall be placed so as to not damage existing landscape or man-made improvements. Surcharging of any bank is not allowed.

D. Rock Excavation:

1. Rock excavation shall mean rock requiring drilling and blasting that occupies an original volume of at least 1 cubic yard. Rock shall be considered as material that cannot be removed with a crawler tractor equal to a D-8 Caterpillar, equipped with a single-tooth ripper or by an excavator trackhoe equal to a Caterpillar 225 rated with a ¾ cubic yard capacity with a bucket curling pullout capacity of 25,000 pounds.
2. Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the Drawings or as otherwise directed by the County. The Contractor shall be responsible for obtaining all blasting permits required.
3. If excess excavation is made or the material becomes disturbed so as to require removal below final subgrade elevations or beyond the prescribed limits, the resulting space shall be refilled with Class B concrete in accordance with Section 03300, Cast-in-Place Concrete.

3.03 EXCAVATING FOR STRUCTURES

A. Excavation:

1. All excavation is unclassified and shall be included in the Contractor's Base Bid.
2. Excavation shall include all substances to be excavated. Excavation for structures shall be to limits not less than 2 feet outside wall lines, to allow for formwork and inspection.
3. Where rock excavation is carried below grade, the **Contractor** shall backfill to grade using concrete or structural fill.
4. Where unsuitable material is encountered, the **Contractor** shall excavate material to a depth acceptable to the **County** and fill with compacted structural fill as required.

B. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock, or compacted materials to ensure proper bearing.

1. Unsuitable Foundation Material

    a. Any material in the opinion of the **County** that is unsuitable for use in a foundation shall be removed and replaced with coarse aggregate or structural fill material, as directed by the **County**.
    b. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.

2. Foundation in Rock: Foundations for a structure shall be on similar materials. Should excavation for a foundation be partially in rock, the **Contractor** shall undercut that portion of the rock 12 inches and bring the excavation to grade with compacted crushed stone.

C. Construction Observations:

1. All excavations should be examined by the **County** prior to reinforcing steel placement to verify that the design bearing pressure is available. All excavations should be clean, level and free of ponded water, mud and loose, frozen or water-softened soils. If it is necessary for an excavation to remain open overnight, or if rain is imminent, a 3-to 4-inch thick "mud mat" of Class B concrete may be placed in the bottom of the excavation to protect the bearing soils until reinforcing steel and concrete can be placed.

D. Unsuitable Bearing:

1. If unsuitable bearing for foundations is encountered at the elevations indicated on the Drawings, the **County** shall be notified immediately.

3.04 EXCAVATION BELOW GRADE AND REFILL

A. If the bottom of any excavation is taken out below the limits shown on the Drawings or specified, it shall be refilled to the bottom grade, at the **Contractor's** expense, except where rock or unsuitable soil is encountered. The refill shall be 6-inch layers of structural fill or other material satisfactory to the **County**. The type of material to be used shall be the **County's** option.

3.05 BACKFILL AND FILL PLACEMENT

A. Compaction of fill shall be accomplished by placing the fill material in horizontal lifts of 8 inches maximum loose thickness and mechanically compacting each lift to at least the specified dry density.

B. All fill placement shall be witnessed by an experienced soils technician of the Testing Laboratory and fill density and moisture tests for each lift shall be performed to verify that the specified degree of compaction is being achieved.

C. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed as described under Excavation. Area to receive fill shall then be scarified to a depth of at least 6 inches.

D. The fill shall be brought to the proposed elevation by placing and compacting only approved fill materials upon a subgrade approved by the **County**.

E. Fill materials shall be placed in continuous approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practicable.

F. The fill shall be placed at a moisture content that corresponds to a +/- 3 percent of the optimum moisture content, as determined by the standard Proctor moisture-density relationship test.

G. Compaction:

1. The fill shall be uniformly compacted to a dry density that corresponds to at least 95 percent of the standard Proctor maximum dry density (ASTM D 698) of the fill soil.
2. The upper 12 inches of fill beneath the structures and pavement areas shall be compacted to 98 percent of the standard Proctor maximum dry density.
3. Scarification and recompacting of the upper fill soils immediately prior to the slab-on-grade and/or pavement construction shall be required.
4. Compaction of embankments shall be by sheepsfoot rollers with staggered uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend beyond the final contours sufficiently to ensure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer or grader shaping the face of the embankment.
5. The backfill placement in trenches and behind structures shall be uniformly compacted to a dry density that corresponds to at least 95% of the standard Proctor maximum dry density (ASTM D 698) of the fill soil. In confined areas requiring portable compaction equipment the fill material shall be placed in horizontal lifts of 4 inches maximum loose thickness.
6. If tests indicate that density of backfill fill is less than that specified, the area shall either be recompacted or undercut, filled, and compacted until specified density is achieved.
7. If compaction cannot be achieved by mechanical equipment due to conflicts with utilities, flowable fill meeting the specifications may be used with the **County's** approval and at the **Contractor's** expense.

H. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

I. Moisture:

1. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.
2. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

J. Proofrolling:

1. All areas where pavement or structures are to be built on compacted fill and other areas where indicated on the Drawing, shall be proofrolled to detect soft spots prior to the placement of fill material or construction of foundations.
2. Proofrolling shall consist of the moving a 20- to 30-ton loaded dump truck or pneumatic tire roller over the subgrade after the subgrade is shaped. Proofrolling shall be witnessed by the County.
3. Pneumatic-tired rollers shall have not fewer than four pneumatic tired wheels that shall be of such size and ply that tire pressures can be maintained between 80 and 100 psi for a 25,000-pound wheel load during rolling operations. Unless otherwise required, rolling shall be done with tires inflated to 90 psi. The roller wheels shall be located abreast in a rigid steel frame. Each wheel shall be loaded with an individual weight box so that each wheel will bear an equal load when traversing uneven ground. The weight boxes shall be suitable for ballast loading such that the load per wheel shall be 25,000 pounds. The spacing of the wheels shall ensure that the distance between the nearest edges of adjacent tires shall be not greater than one-half of the tire width of a single tire at the operating pressure for a 25,000-pound wheel load. The roller shall be operated not faster than 5 feet/second.
4. Subgrade shall be proofrolled with six passes. Depressions that develop during the proofrolling operation shall be filled with suitable material and those filled areas shall be proofrolled with six passes. If, after having been filled and proofrolled, the subgrade still contains depressions, the soil shall be undercut to the full depth of the soft material or 5 feet whichever is less, backfilled, and rolled to achieve a compacted subgrade.
5. After the proofrolled subgrade has been accepted by the **County**, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 0.04 feet at every point.
6. Conduits, pipes, culverts and underdrains shall be neither disturbed nor damaged by proofrolling operations. Rollers shall neither pass over, nor approach closer than 5 feet to conduits, pipes, culverts and underdrains unless the tops of those facilities are deeper than 3 feet.

K. During wet or rainy periods, aeration (drying) shall be required to reduce the fill materials to the required moisture condition. During dry periods, water shall be added to achieve the proper moisture content for compaction. Silty soils, which are wet, shall require aeration prior to compaction even during dry periods.

3.06 BACKFILLING AROUND STRUCTURES

A. General:

1. Remove debris from excavations before backfilling.
2. Do not backfill against foundation walls until so instructed by the County.
3. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.
4. Do not backfill on only one side of vertically spanning walls unless walls are adequately shored or permanent construction is in place to furnish lateral support on both top and bottom of wall.

3.07 GRADING

A. General:

1. Perform all rough and finish grading required to achieve the elevations indicated on the Drawings.
2. Perform rough grading to an accuracy of plus or minus 0.10 feet.

B. Grading Around Buildings: Control the grading around buildings so the ground is pitched to prevent water from running into the excavated areas of a building or damaging other site features.

C. Treatment After Completion of Grading:

1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the **County**.
2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.08 EXCESS WATER CONTROL

A. Unfavorable Weather:

1. Do not place, spread, or roll any fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to the **County**.
3. Any inundated area that freezes shall be removed and refilled at the **Contractor's** expense.

B. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collected in depressions.

C. Pumping, Drainage and Dewatering:

1. Provide, maintain, and use at all times during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the Work.
2. Dewater by means that will ensure dry excavations, preserve final lines and grades, and not disturb or displace adjacent soil.

3. All pumping and drainage shall be done with no damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic or the work of other contractors, and in accordance with all pertinent laws, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

3.09 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments, which may occur within 1 year after final acceptance of the Work by the **County**.

B. The **Contractor** shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the County.

3.10 CLEANING

A. Upon completion of the work of this Section, remove, in a lawful manner, all rubbish, trash, and debris resulting from construction operations. Remove surplus equipment and tools. Leave the site in a neat and orderly condition acceptable to the **County**, and in conformance with the General Conditions of the Contract Documents.

+++END OF SECTION 02200+++

SECTION 02224
PIPE BORING AND JACKING

PART 1 – GENERAL

1.01 SCOPE

A. The work covered by this Section includes furnishing all labor, materials, and equipment required to bore and jack casings or construct tunneled crossings and to properly complete pipeline construction as described herein and/or shown on the Drawings.

B. General: Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable. If requested by the **County**, submit evidence that the manufacturer has consistently produced products of satisfactory quality and performance over a period of at least 2 years.

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 Submittals. In addition, the following specific information shall be provided:

B. Method Submittals: As directed by the **County**, the **Contractor** shall provide for the County's approval, a detailed plan for the methods proposed for the construction of the casing or tunnel. These plans shall address the following:

1. Groundwater Control: The **Contractor** shall control the groundwater throughout the construction of the casing. The groundwater shall be controlled by dewatering (well points, sumps, or deep wells), grouting, freezing or other method approved by the **County**. The **Contractor** shall prepare a written, detailed plan for controlling groundwater, citing similar installation conditions and results. This plan shall be submitted to the **County** prior to any construction for the casing.
2. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing or tunnel.
3. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the **Contractor**. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the **Contractor**, at no additional cost with the approval of the **County**. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal length may be necessary.
4. Bore and Jack Method:

a. With **County** approval, the **Contractor** has the option to select the bore and jack method, including groundwater control, except as restricted herein.

b. The **Contractor** shall submit working drawings, written procedure, and calculations describing in detail the proposed bore and jack method and entire operation. This shall include, but not be limited to, groundwater control, ground stabilization if proposed, excavation procedures, control of casing alignment and grade, support of face, detection of surface movement, procedure for installing pipes and anchors and placement of an approved fill material between pipe and casing. If, in opinion of the **Contractor**, modifications to the methods are required during construction, working drawings shall be submitted for **County** approval delineating such modifications, including reasons for the modifications. Preparation of these drawings will be at no cost to the **County**.

5. Tunneling Method.

C. Material Submittals: The **Contractor** shall provide for the **County's** approval, shop drawings, proposed construction drawings, and other pertinent specifications and product data as follows:

1. Shop drawings for casing pipe and tunnel liner plate showing sizes and connection details
2. Design mixes for concrete and grout
3. Casing Spacers

D. Experience Submittals

1. Boring and jacking casings and tunnel construction is deemed to be specialty contractor work. If the **Contractor** elects to perform the work, the **Contractor** shall provide evidence of experience as required by the General Requirements of the Contract Documents. A minimum of 5 continuous years of experience in steel casing and tunnel construction is required of the contractor proposed to do the work. Evidence of this experience shall be provided with the shop drawings for approval by the **County**.

1.03 STORAGE AND PROTECTION

A. All materials shall be stored and protected in accordance with the manufacturer's recommendations and as approved by the **County**.

PART 2 – PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. Casing:

1. The casing shall be new unused pipe made from steel plate having minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A 36.
2. As directed by the **County,** the outside of the casing pipe shall be coated with coal tar epoxy having a minimum dry film thickness of 16 mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of 65 percent by volume and shall be air or airless spray applied, minimum drying time shall be 7 days. Brushing shall be permitted in small areas only. All coating and recoating shall be done in strict accordance with the manufacturer's recommendations. Epoxy shall be Tnemec, Kop-Coat, Valspar or approved equal and submitted for approval by the County.
3. Minimum casing thicknesses are shown on the Drawings. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking and all calculations shall be submitted for approval by the **County**. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the **County**.
4. Minimum diameters of casing are shown on the Drawings. Larger casings, with the **County's** approval, may be provided at no additional cost to the **County**, for whatever reasons the **Contractor** may decide, whether due to casing size availability, line and grade tolerances, soil conditions, etc.

B. Liner Plate

1. Liner plates shall be of the thickness shown on the Drawings. The liner plates shall be either the four-flange type or the two-flange lap-joint type. Bolts and nuts used with the two -flange plates shall be a minimum of 5/8 inch in diameter and shall conform to the latest revision of ASTM A 307 for plate thickness less than 0.209 inch, and ASTM A 449 for plate thickness equal to or greater than 0.209 inch. Bolts and nuts used with four-flange plates shall be not less than ½ inch in diameter for plate thicknesses to and including 0.179 inch and not less than 5/8 inch in diameter for plates of greater thickness. The bolts and nuts shall be quick-acting coarse thread and shall conform to ASTM A 307, Grade A. Each ring shall have 2-inch-diameter half couplings and plugs for grouting, located as shown on the detailed drawings. Liner plates, bolts, and calculations shall be submitted to the **County** for approval.

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be Cascade Waterworks Manufacturing Company, Advanced Products & Systems, Inc., or approved equal.

2. Casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide fiberglass reinforced polyester insula duty PVC inner liner, minimum 0.09-inch thick, having a hardness of 85-90 durometer, and all stainless steel hardware shall be Pipeline Seal and Insulator, Ltd., or approved equal.
3. Casing spacers shall be designed for the general configuration shown in the Plans, including provisions for other conduits to be installed with the carrier pipe.

D. Carrier Pipe: Carrier pipes shall be as specified in Section 02665, Water Mains and Accessories. All joints of pipe in casing shall be restrained.

E. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs. The **Contractor** may substitute alternate methods for **County** approval.

2.02 EQUIPMENT

A. Casings

1. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.
2. On casing pipe for water lines over 60 feet in length, the installation equipment shall include a steering head and a grade indicator.
3. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing, which would indicate the elevation of the front end of the casing or some other means for grade indication approved by the **County**.

B. Tunnels

1. Tunnel Boring Machine (TBM)
   a. The TBM's design shall be submitted for approval by the **County**. The TBM shall be minimally equipped with disc cutters of diameter 19 inches or greater designed for operation at thrusts of up to 70 kips per cutter.
   b. The TBM shall afford adequate protection against loss of ground and permit ground support adjacent to the tunnel face, as required by ground conditions.
   c. The TBM shall be equipped with a dust control system which includes a water spray system, dust shield and dust scrubber system.
   d. The method used to advance the TBM shall ensure its correct alignment at all times, without binding or imposing excessive loads on the primary tunnel supports or upon the surrounding ground.
   e. The TBM shall be equipped with a roll indicator and laser target system, which allows the operator to observe the machine's alignment and orientation (predictor system) from the control station.

f. The TBM shall be grounded in accordance with the latest requirements of the National Electrical Code and equipped with ground fault protection.

2. Other tunneling Equipment
   a. Power machinery and tools within the tunnel shall be operated by either electricity, compressed air, diesel with approved scrubber or other approved power. Electrical tools and equipment shall be grounded in accordance with the latest equipments of the National Electrical Code.
   b. All electrical equipment and power receptacles shall have appropriate ground fault protection.
   c. Provide temporary electrical lights to properly and safely illuminate all part of the shafts and tunnel including special illumination at the working face. Lighting circuits shall be thoroughly insulated and separated from power circuits, and lights shall be enclosed I wire cages. Secure electrical permits required for successful completion of this work.

PART 3 – EXECUTION

3.01 GENERAL

A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the **Contractor**. Rock and/or water, if encountered, shall not entitle the **Contractor** to additional compensation. With approval from the **County,** the **Contractor** may perform additional soil investigation at no cost to the **County**.

B. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be carried out in such a manner that removal of soil particles is held to a minimum. Dewatering shall comply with the approved Temporary and Permanent Erosion and Sediment Control Plan.

C. Methods of dewatering shall be at the option and responsibility of the **Contractor**. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the **County** immediately and take such action as necessary to maintain safe conditions and prevent damage.

D. Casing and tunnel construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the work. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The **Contractor** shall be responsible for all settlement resulting from operations and shall repair and restore all damaged property to its original or better condition and is responsible for all associated damages at no cost to the **County**.

3.02 SAFETY

A. Provide all necessary bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it in those areas immediately adjacent and outside the active project work area.

B. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons."

3.03 SURFACE SETTLEMENT MONITORING

A. Provide surface settlement markers, placed as specified and as directed by the **County**. The **Contractor** shall place settlement markers outside the pavement area, along the centerline of the casing or tunnel at 20-foot intervals. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement, and at 10 and 25 feet offset in each direction from the centerline of the casing. Tie settlement markers to benchmarks and indices sufficiently removed so as not to be affected by the **Contractor's** operations.

B. Make observations of surface settlement markers, placed as required herein, at intervals acceptable to the **County**. In the event settlement or heave on any marker exceeds 1 inch, the **Contractor** shall immediately cease work and using a method submitted and approved by the **County**, take immediate action to restore surface elevations to those existing prior to start of the **Contractor's** operations.

C. Take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within 50 feet of the casing or tunnel heading, at the beginning of each day; more frequently at the **County's** direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot.

D. The **Contractor** shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by and at the expense of the **Contractor**.

E. Promptly report any settlement and horizontal movement immediately to the **County** and take immediate remedial action at no cost to the **County**.

3.04 BORING AND JACKING

A. Shaft

1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform shaft dewatering operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base to create the support necessary to perform the required boring and jacking operation at no extra cost to the **County**.

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wetboring.

D. Auger the hole and jack the casing through the soil simultaneously.

E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.

G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation.

H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the **County**, or removed and replaced at the **Contractor's** own expense.

I. Lengths of casing pipe as long as practical shall be used except as restricted otherwise. Joints between sections shall be completely welded in accordance with AWS recommended procedures. Prior to welding the joints, the **Contractor** shall ensure that both ends of the casing sections being welded are square.

J. The **Contractor** shall submit a contingency plan to the **County** for approval to allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

K. Once the jacking procedure has begun, it shall be continued without stopping until completed, subject to weather and conditions beyond the control of the **Contractor**.

L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.

M. The **Contractor** shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring, and bracing for embankments, operating pits, and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work,

sheeting, shoring, and bracing shall be left in place, cut off, or removed, as directed by the County.

O. Refer to Section 02200, Earthwork and Section 02324, Trenching and Trench Backfilling for additional information related to trench excavation, all classes and types of excavation, the removal of rock, muck and debris, and the excavation of all working pits and backfill.

3.05 TUNNELS

A. Shaft Excavation

1. Excavate in such a manner that overbreak is held to a minimum. In soil and mixed face conditions, install primary support in continuous and close contact with the excavated surface to control water inflow and prevent ground loss, so that adjacent structures are not affected by ground movements. Excavation in soil shall not be advanced ahead of the previously installed primary support any more than is necessary for the installation of the succeeding section of primary support.
2. Whenever shaft sinking is suspended, complete prairie support to the excavated surfaces and keep any dewatering system operating. The Contractor shall have qualified personnel periodically check conditions that might threaten the excavation stability.
3. Remove excavated soil and rock from the site and dispose of properly complying with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials. All required inspections, permits, and fees are the **Contractor's** responsibility and at no cost to the **County**.
4. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

B. Tunnel Excavation

1. Excavate in such a manner that overbreak is held to a minimum.
2. Where water inflows in the tunnel face are large and increasing, the **County** shall instruct the **Contractor** to drill probe holes, relief holes, and ground treatment holes in the tunnel face, and to carry out consolidation grouting before proceeding.
3. Whenever tunneling is suspended, complete installation of the primary support for that excavation cycle. Have qualified personnel periodically check conditions that might threaten tunnel stability.
4. Remove excavated rock from the excavation of the TBM erection, transit and reception chambers and dispose of properly at a location secured by the **Contractor**.

C. The **Contractor** shall submit to the **County**, for approval, a grouting schedule based on liner plate completion in time intervals and distances. The liner plates shall be installed progressively as excavation proceeds. Excavation shall not continue more than 24 inches past the end of the liner plate already in place. At this time, an additional section of liner shall be installed before excavation continues. Grout shall be placed under pressure in the annular void as the excavation proceeds. Grout should be continuously placed as close to the heading as possible, using grout stops if necessary. Grout shall be injected in the lower holes first, moving upward as the back space is filled. Threaded plugs shall be installed after filling each grout hole.

3.06 VENTILATION AND AIR QUALITY

A. Provide, operate, and maintain for the duration of the casing project a ventilation system to meet safety and OSHA requirements.

3.07 ROCK EXCAVATION IN CASING

A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the **County**, cannot be removed through the casing, the **County** may authorize the **Contractor** to complete the crossing with a tunnel.

B. With the **County's** approval, the **Contractor** may continue to install the casing and remove the rock through the casing at no additional cost to the **County**.

3.08 INSTALLATION OF PIPE

A. After construction of the casing or tunnel is complete, and has been accepted by the **County**, install the pipeline in accordance with the Drawings and Specifications.

B. Check the alignment and grade of the casing and submit a plan to the **County** for approval to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

C. The carrier pipe shall be held in the casing pipe by the use of casing spacers. The casing spacers shall be designed by the **Contractor** such that the carrier pipe can be installed in the casing. For tunnels, the carrier pipe will be held in place with a steel strap per the details.

D. With **County** approval and as directed by the **County,** close the ends of the casing or tunnel with 4-inch brick walls, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement.

3.09 SHEETING REMOVAL

A. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring, and bracing shall be done in such a manner so as not to endanger or damage either new or existing structures or private or public properties, and also to avoid cave-ins or sliding in the banks.

+++ END OF SECTION 02224 +++

SECTION 02231
TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.01 SCOPE

A. This section includes the protection and trimming of trees that interfere with, or are affected by, execution of the Work, whether temporary or new construction.

B. Related Work specified elsewhere:

1. Section 02200 - Site Preparation
2. Section 02315 - Excavation and Backfill for Structures
3. Section 02324 - Trenching and Trench Backfilling
4. Section 02821 - Chain Link Fences and Gates
5. Section 02920 - Site Restoration
6. Section 02930 - Landscaping

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. Product Data: For each type of product indicated.

2. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. The **Contractor** shall include lists of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.

3. Certification: From a qualified forester that trees indicated to remain have been protected during construction according to recognized standards and that the trees were promptly and properly treated and repaired when damaged.

4. Maintenance Recommendations: From a certified arborist for care and protection of trees affected by construction during and after completing the Work.

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. Hortus Third, 1976
2. Standardized Plant Names (American Joint Committee on Horticulture Nomenclature)

3. National Arborist Association “Pruning Standards for Shade Trees”, latest revision
4. ANSI A 300 – Trees, Shrubs, and Other Woody Plant Maintenance – Standard Practices
5. ASTM D 448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
6. ASTM D 5268 – Standard Specification for Topsoil Used for Landscaping Purposes

B. Forester Qualifications: A forester licensed in the State of Georgia.

C. Tree Pruning Standards: The **Contractor** shall comply with the requirements of ANSI A300 unless more stringent requirements are indicated.

D. Pre-installation Conference: The **Contractor** shall conduct a pre-installation conference at the site of the Work.

1. Before starting tree protection and trimming, the **Contractor** shall meet with representatives of authorities having jurisdiction, including the **County**, consultants, and other concerned entities. The **Contractor** shall review tree protection and trimming procedures and responsibilities. The **Contactor** shall notify participants at least 3 working days before convening the conference. The **Contractor** shall record discussions and agreements and furnish a copy to each participant.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D448, Size 24, with 90 to 100 percent passing a 2½-inch sieve and not more than 10 percent passing a ¾-inch sieve.

B. Topsoil: Fertile, friable, surface soil, containing natural loam and complying with the requirements of ASTM D5268. The **Contractor** shall provide topsoil that is free of stones larger than 1 inch in any dimension and free of other extraneous or toxic matter harmful to plant growth. The **Contractor** shall obtain topsoil only from well-drained sites where soil occurs in depth of 4 inches or more; the **Contractor** shall not obtain topsoil from bogs or marshes.

C. Filter Fabric: Manufacturer’s standard, non-woven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

D. Webbed Fabric Fence (temporary fencing): Orange polyethylene webbed fabric, 46 inches high supported by 6-foot steel channel posts, 5 feet on center. The **Contractor** shall set posts 2 feet below grade.

E. Chain Link Fence: Shall meet the requirements of Section 02821.

PART 3 - EXECUTION

3.01 IDENTIFICATION

A. Prior to any construction, the **Contractor** shall flag all trees on the site of the Work scheduled to be protected. All flagging shall be approved by the **County** prior to start-up of the Work and construction activities. The **County** shall be notified immediately of any conflicts with proposed Work, structures, or utilities.

3.02 PREPARATION

A. Temporary Fencing: The **Contractor** shall install temporary fencing as indicated on the Plans or outside the drip line of trees to protect remaining vegetation from construction damage.

1. The **Contractor** shall install chain link fence according to the requirements of Section 02821.

B. The **Contractor** shall protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. The **Contractor** shall protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.

C. The **Contractor** shall not store construction materials, debris, or excavated material within the drip line of remaining trees. The **Contractor** shall not permit vehicles or foot traffic within the drip line. The **Contractor** shall prevent soil compaction over root systems.

D. The **Contractor** shall not allow fires under or adjacent to remaining trees or other plants.

3.03 EXCAVATION

A. The **Contractor** shall install shoring or other protective support systems to minimize sloping or benching of excavations that could endanger trees.

B. The **Contractor** shall not excavate within drip line of trees, unless otherwise indicated or approved by the **County**.

C. Where excavation for new construction is required within drip line of trees, the **Contractor** shall hand clear and excavate to minimize damage to root systems. The **Contractor** shall use narrow-tine spading forks and comb soil to expose roots.

1. The **Contractor** shall relocate roots in backfill areas where possible. If encountering large, main lateral roots, the **Contractor** shall expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to the location of new construction and relocation is not practical, the **Contractor** shall cut roots approximately 3 inches back from new construction.

2. The **Contractor** shall not allow exposed roots to dry out before placing permanent backfill. The **Contractor** shall provide temporary earth cover or pack with peat moss and wrap with burlap. The **Contactor** shall water and maintain earth in a moist condition. The **Contractor** shall temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within the drip line of trees, the **Contractor** shall tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: The **Contractor** shall not cut main lateral roots or taproots. The **Contractor** shall cut only smaller roots that interfere with installation of utilities. The **Contractor** shall cut roots with sharp pruning instruments. The **Contractor** shall not break or chop roots.

3.04 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, the **Contractor** shall slope grade away from trees as recommended by the forester, unless otherwise directed by the **County**.

1. Root Pruning: The **Contractor** shall prune tree roots exposed during grade lowering. The **Contractor** shall not cut main lateral roots or taproots. The **Contractor** shall cut only smaller roots. The **Contractor** shall cut roots with sharp pruning instruments. The **Contractor** shall not break or chop roots.

B. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, the **Contractor** shall fill with topsoil. The **Contractor** shall place topsoil in a single un-compacted layer and hand grade to required finish elevations.

C. Moderate Fill: Where existing grade is more than 6 inches, but less than 12 inches below elevation of finish grade, the **Contractor** shall place drainage fill, filter fabric, and topsoil on existing grade as follows:

1. Carefully place drainage fill against tree trunk approximately 2 inches above elevation of finish grade and extend not less than 18 inches from the tree trunk on all sides. For balance of area within drip line perimeter, the **Contractor** shall place drainage fill up to 6 inches below elevation of grade.

2. The **Contractor** shall place filter fabric with edges overlapping 6 inches minimum.

3. The **Contractor** shall place fill layer of topsoil to finish grade. The **Contractor** shall not compact drainage fill or topsoil. The **Contractor** shall hand grade to required finish elevations.

3.05 TREE PRUNING

A. The **Contractor** shall prune remaining trees affected by temporary and new construction.

B. The **Contractor** shall prune remaining trees to compensate for root loss caused by damaging or cutting root system. The **Contractor** shall provide subsequent maintenance during Contract period as recommended by the forester.

C. Pruning Standards: The **Contractor** shall prune trees according to the most current revision of ANSI A300 following the following types of pruning:

1. Crown cleaning
2. Crown thinning
3. Crown raising
4. Crown reduction
5. Vista pruning
6. Crown restoration

D. The **Contractor** shall cut branches with sharp pruning instruments. The **Contractor** shall not break or chop branches.

E. The **Contractor** shall chip branches removed from trees. The **Contractor** shall spread chips where indicated or as directed by the **County**.

3.06 TREE REPAIR AND REPLACEMENT

A. The **Contractor** shall promptly repair trees damaged by construction operations within 24 hours. The **Contractor** shall treat damaged trunks, limbs, and roots according to written instructions of the certified arborist.

B. The **Contractor** shall remove and replace dead and damaged trees that the certified arborist determines to be incapable of returning to a normal growth pattern.

C. The **Contractor** shall aerate surface soil compacted during construction 10x feet beyond drip line and no closer than 36 inches to tree trunk. The **Contractor** shall drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches on center The **Contractor** shall backfill holes with an equal mix of augered soil and sand.

3.07 DISPOSAL OF WASTE MATERIALS

A. Burning at the site of the Work is not permitted.

B. Disposal: The **Contractor** shall remove excess excavated material, displaced trees, and excess chips from the site and dispose of at an approved location.

3.08 MAINTENANCE

A. All protected trees that have been root pruned shall be watered deeply twice a week during periods of hot, dry weather.

3.09 REPLACEMENT

A. The **Contractor** shall be responsible for replacement of any protected trees that are damaged or destroyed during the construction period. Replacement shall be in equal caliper inches (D.B.H.) to those trees damaged or destroyed and shall be in like species unless otherwise determined by the **County**.

3.10 ADJUSTING AND CLEANING

A. At the end of the construction period, the **Contractor** shall remove all protection fencing, trash, and debris within the protection area and finish grade and cover in accordance with the requirements of these Specifications.

+++ END OF SECTION 02231 +++

SECTION 02302
GRANITE CURB

PART 1 - GENERAL

1.01 SCOPE

A. The work covered under this section includes furnishing all labor, equipment, and materials required to furnish and set granite curb in accordance with the plans and specifications, where shown on the plans or directed by the **County**.

B. Related Work Specified Elsewhere:

1. Section 02000 – Site Work.

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. Two small samples of finished product granite curb.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The granite curbs shall be type A granite curbs. The **Contractor** shall submit adequate samples to the **County** for approval.

B. All granite material must first be approved by the **County** before any ordering or installation occurs.

C. All granite curb shall be tough, sound, durable, uniform in color and free from rifts, seams and laminations. They shall be not less than 3 feet nor more than 8 feet in length, 18 inches to 24 inches in depth and matched width at the top to be 6 inches. The granite shall be as shown on the drawings.

D. The front of all substone shall have a battered finished surface with a ¾-inch bullnose at the battered edge. The granite shall have no depressions greater than ¼ inch from a straight edge the same length as the stone. The remainder of the face shall be free from projections greater than ½ inch, and the back for 3 inches down from the top shall be satisfactorily dressed. The ends for the full width of the stone to a point 14 inches down from the top of the curb shall be close jointed, square to the top and face; the remainder of the end shall be cut so that there will be a fairly close joint. The bottom of the stones shall be roughly squared.

2.02 FINISH

A. The granite curb will have a sawn finish on the top and a split finish on the face of the curb. The **County** must approve all curbing before **Contractor** orders or installs the curb.

PART 3 - EXECUTION

3.01 SETTING

A. Curb shall be set with close joints. The top front edge of the curb shall present a fair and unbroken line and the face a plane surface with a batter of 1 to 12. The curbstone at the comers of intersecting joints shall be of the same quality as the curb hereinbefore specified and shall be set in the same manner. On curbs where drainage basins are located, such special shaped stones as may be required shall be furnished and set. At ramps and wherever required, special shaped stones shall be furnished and set.

B. Curb trenches shall be opened to their full width and depth well in advance of the setting of the curb. The foundation for curb shall be concrete. The bottom layer of concrete shall be 6 inches thick; the concrete in front and back of the curb shall be deposited simultaneously to the required height. Backfill and compaction shall meet minimum requirements.

+++ END OF SECTION 02302 +++

SECTION 02324
TRENCHING AND TRENCH BACKFILLING

PART 1 - GENERAL

1.01 SCOPE

A. The work covered under this section consists of furnishing all labor, equipment, and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines shown on the Plans and as specified in these Specifications.

B. Excavation shall include the removal of any trees, stumps, brush, debris, or other obstacles that remain after the site preparation operations that may obstruct the Work. Excavation shall also include the excavation and removal of all earth, rock, or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the Plans and as specified in these Specifications.

C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.

D. Trenches are divided into five specific areas:

1. Foundation: The area beneath the bedding, sometimes also referred to as trench stabilization.

2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.

3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.

4. Initial Backfill: The area above the haunching material and below a plane 12 inches above the top of the barrel of the pipe.

5. Final Backfill: The area above a plane 12 inches above the top of the barrel of the pipe.

E. The choice of method, means, techniques, and equipment rests with the **Contractor**. The **Contractor** shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way, and prevailing practice in the area.

F. When hazardous or contaminated materials are encountered while performing trench excavation, the **Contractor** shall stop work, and report the hazardous or

contaminated materials to the **County** immediately. The **County** will instruct the **Contractor** on the required procedures.

G. Related Work Specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 02200 - Site Preparation
3. Section 02205 - Dewatering
4. Section 02315 - Excavation and Backfill for Structures
5. Section 02318 - Rock Removal
6. Section 02340 - Slope Protection and Erosion Control
7. Section 02535 - Gravity Flow Sanitary Sewers
8. Section 02538 - Sanitary Sewer Service Lateral Reconnection and Repairs
9. Section 02635 - Storm Sewers and Culverts
10. Section 02640 - Manholes, Catch Basins, Inlets, and Inspection Holes
11. Section 02700 - Pavement Repairs

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. The **Contactor** shall submit a work plan for trenching and trench backfilling with complete written description which identifies details of the proposed method of construction and the sequence of operations for construction relative to trenching and trench backfilling. The descriptions, with supporting illustrations, shall be sufficiently detailed to demonstrate to the **County** that the procedures meet the requirements of the Plans and these Specifications.

2. The **Contractor** shall submit a dewatering plan in accordance with the requirements of Section 02140 - Dewatering.

3. The **Contractor** shall submit backfill material sources and product quality information.

4. The **Contractor** shall submit record documents in accordance with the requirements of the General Conditions. The **Contractor** shall record locations of sewers, as installed, referenced to survey benchmarks. The **Contractor** shall include locations of utilities encountered or rerouted. The **Contractor** shall give horizontal dimensions, elevations, inverts, and gradients. The **Contractor** shall use either GPS technology or conventional survey to locate utilities.

5. The laboratory shall submit the following reports directly to the **County** from the testing services, with a copy to the **Contractor**.

    a. Test reports on borrow material
    b. Verification of each footing subgrade

c. Field density test reports
d. One optimum moisture-maximum density curve for each type of soil encountered
e. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. ASTM C33 - Concrete Aggregates
2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3, or 600 kN-m/m^3)
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)
5. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method
6. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3, or 2,700 kN-m/m^3)
7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

B. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D1557, except that cohesionless, free-draining soils "maximum dry density" shall mean the maximum index density as determined by ASTM D4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet the requirements of ASTM D1556 and ASTM D2922.

C. Sources and Evaluation Testing: Testing of materials to certify conformance with these Specifications shall be performed by an independent testing laboratory approved by the **County**.

1.04 SAFETY

A. The **Contractor** shall perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The **Contractor** shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

1.05 TESTING

A. Tests and analysis of fill and borrow material shall be performed in accordance with the requirements of ASTM D1557.

B. Testing shall be performed by an approved independent commercial testing laboratory. The **Contractor** shall coordinate testing.

C. Compaction testing shall be performed in accordance with the requirements of ASTM D1556 or ASTM D2292.

D. If tests indicate the Work does not meet specified requirements, the **Contractor** shall remove, replace, and retest the Work at no cost to the **County**.

1.06 JOB CONDITIONS

A. All operations shall be performed by the **Contactor** in strict conformance with OSHA regulations and any applicable local safety requirements. The Contractor shall pay particular attention to safety regulations for excavations and entering confined spaces.

B. Test borings and other exploratory operations may be made by the **Contactor** with **County** approval at no cost to the **County**.

C. The **Contractor** shall verify that survey benchmarks and intended elevations for the Work are as indicated on the Plans.

D. The **Contractor** shall locate existing underground utilities in the site of the Work. If utilities are to remain in service and in place, the **Contractor** shall provide adequate means of support and protection during trenching and trench backfilling.

E. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the **Contractor** shall consult the utility owner immediately for directions. The **Contractor** shall cooperate with utility companies in keeping respective services and facilities in operation. The **Contractor** shall repair damaged utilities to the satisfaction of the utility owner and all cost associated with the damage.

F. Unless specified otherwise in other Specifications Sections, the **Contractor** shall not interrupt existing utilities serving any facilities, during occupied hours, except when permitted in writing by the **County** and then only after acceptable temporary, utility services have been provided.

G. The **Contractor** shall provide a minimum of 48 hours notice to the **County** and utility owner, and receive written notice to proceed before interrupting any utility.

H. The **Contractor** shall demolish and completely remove from the site of the Work existing underground utilities indicated on the Plans to be removed. The **Contractor** shall coordinate with utility companies for shut-off of services if lines are active. No separate payment will be made.

I. The **Contractor** shall protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavations. Where indicated in the Plans or directed by the **County**, the **Contractor** shall use augured piles and lagging. Angered driven piles shall be used instead of vibratory driven piles when near structures or existing sewers.

J. The **Contractor** shall notify the **County** of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.

K. The **Contractor** shall protect the bottom of the trench and soil adjacent to and beneath trench from frost.

L. The **Contractor** shall prevent surface water run-off into a trench.

M. It is intended that the Plans show the locations of all known existing surface and subsurface structures. However, the locations of many gas mains, water mains, conduits, and sewers, is unknown and the **County** assumes no responsibility for failure to show any or all of these structures on the Plans or to show them in their exact locations. It is mutually agreed that such failure will not be considered sufficient basis for claims for extra work or for increasing the pay quantities, unless an obstruction encountered is such as to necessitate substantial changes in the lines or grades or requires the building of special structures, provisions for which are not made in the Plans. Any substantial change will be determined and approved by the **County**.

- PRODUCTS

2.01 TRENCH FOUNDATION MATERIALS

A. Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.02 BEDDING AND HAUNCHING MATERIALS

A. Unless specified otherwise, bedding and haunching materials shall be crushed stone as specified below.

B. Crushed stone utilized for bedding and haunching shall meet the requirements of Section 02060 - Crushed Stone Aggregate and of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be No. 57.

B. Filter Fabric - Non-Woven Type

1. Filter fabric associated with bedding shall be a UV stabilized, spunbonded, continuous filament, needle-punched, polypropylene, nonwoven geotextile.

2. The fabric shall have an equivalent open size (EOS or AOS) of 120 to 70. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
Weight	oz/yd^2	ASTM D 3776	8.3	
Thickness	mils	ASTM D 1777	105	
Grab Strength	lbs.	ASTM D 4632	240	210
Grab Elongation	%	ASTM D 4632	>50	50
Tear Strength	lbs.	ASTM D 4533	100	85
Mullen Burst	psi	ASTM D 3786	350	320
Puncture Resistance	lbs.	ASTM D 4833	115	100
Permittivity	sec^{-1}	ASTM D 4491	1.7	
Water Permeability	cm/sec	ASTM D 4491	0.4	
Water Flow Rate	gpm/ft^2	ASTM D 4491	120	
UV Resistance (500 hrs)	%	ASTM D 4355	>85	
pH			2 - 13	

3. If directed by the **County**, the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of 10 days during initial pipe installation.

4. Filter fabric shall be equal to Polyfelt TS 700, Trevira 1125 or SuPac 7-MP.

2.03 INITIAL BACKFILL

A. Initial backfill material shall be crushed stone as specified for bedding and haunching materials or earth material meeting the requirements of this section.

2.04 FINAL BACKFILL

A. Final backfill material for unpaved areas shall be general excavated earth materials, shall not contain rock larger than 2 inches at its greatest diameter, cinders, stumps, limbs, man-made wastes, and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, the **Contractor** shall provide select material conforming to the requirements of this section, including compaction requirements.

B. Final backfill material for paved areas shall be crusher run. The **Contractor** shall install crusher run to the subbase elevation in paved areas.

2.05 SELECT BACKFILL

A. Select backfill shall be imported materials that meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

2.06 CONCRETE

A. Concrete for bedding, haunching, initial backfill, or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5½ bags of cement per cubic yard and a slump between 3 and 5 inches. Ready-mixed concrete shall be mixed and transported in accordance with the requirements of ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.07 FLOWABLE FILL

A. Flowable fill, where required for trench backfill, shall be submitted for approval and meet the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, Section 600 for Excavatable or Non-Excavatable type (www.dot.ga.gov/PartnerSmart/Business/Source/specs/ss600.pdf#search=section%20600). The **Contractor** shall receive direction from the **County** on which type of flowable fill shall be used on a case-by-case basis.

2.08 GRANULAR MATERIAL

A. Granular material, where required for trench backfill, shall be sand, river sand, crushed stone or aggregate, pond screenings, crusher run, recycled concrete, or other angular material. Granular material shall meet gradation requirements for Size No. 57 or finer.

2.09 COMPACTION EQUIPMENT

A. Compaction equipment shall be of suitable type and adequate to obtain the amount of compaction specified. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations and shall be maintained in such condition that it will deliver the manufacturer's rated compaction effort.

PART 3 - EXECUTION

3.01 PREPARATION OF PIPELINE EASEMENT

A. Preparation of pipeline easement shall be performed in accordance with the requirements of Section 02200 - Site Preparation. Where clearing or partial clearing of the easement is necessary, the **Contractor** shall clean the easement prior to the start of trenching. The **Contractor** shall cut trees and brush as near to the surface of the ground as practicable, remove all stumps, and pile for disposal. The **Contractor** shall not permit excavated materials to cover brush or trees prior to disposal.

B. The Contractor shall not remove any trees without approval from the **County**.

C. Trees and shrubs farther than 10 feet from pipe centerline shall not be removed unless designated for removal by the **County** and are within the easement. The **Contractor** shall protect all other trees and shrubs.

3.02 DISPOSAL OF CLEARED MATERIAL

A. The **Contractor** shall bear all costs of disposing of trees, stumps, brush, roots, limbs, and other waste materials from the clearing operation. Material shall be disposed of in such a manner as to meet all the requirements of Federal, State, and local regulations regarding health, safety, and public welfare. All cleared material shall be disposed of offsite in an approved location and at the **Contractor's** expense.

3.03 OBSTRUCTIONS

A. This item refers to obstructions that may be removed and do not require replacement. The **Contractor** shall remove obstructions within the trench area or adjacent thereto such as tree roots, stumps, abandoned piling, concrete structures, logs, and debris of all types without additional compensation. The **County** may make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the easement or right-of-way without adversely affecting the intended function of the facility. The **Contractor** shall dispose of obstructions removed from the excavation in accordance with the requirements of this section.

3.04 TRENCH EXCAVATION

A. Topsoil and grass shall be stripped a minimum of 6 inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.

B. Trenches shall be excavated to the lines and grades shown on the Plans with the centerlines of the trenches on the centerlines of the pipes and to the dimensions that provide the proper support and protection of the pipe and other structures and accessories.

C. Trench Width for Pipelines:

1. The sides of all trenches shall be vertical, as much as possible, to a minimum of 1 foot above the top of the pipe. Unless otherwise indicated on the Plans, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus 2 feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.

2. The **Contractor** may excavate the top portion of the trench to the maximum width, within the construction easement or right-of-way, that will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees, or private property. Where necessary to accomplish this, the **Contractor** shall provide sheeting and shoring. The **Contractor** may use trench boxes to stabilize the trench meeting minimum structural loading. The Contractor shall ensure that all shop drawings from the supplier of the trench boxes have been stamped by a Professional Engineer registered in Georgia. The **Contractor** shall also submit to the **County** for approval the sheeting and shoring.

3. Where rock is encountered in trenches, the **Contractor** shall excavate to remove boulders and stones to provide a minimum of 6 inches clearance between the rock and any part of the pipe or manhole. The maximum allowable width of rock excavation for payment shall be the O.D. of the pipe bell to be installed plus 24 inches.

4. Wherever the prescribed maximum trench width is exceeded, the **Contractor** shall use the next higher Class or Type of bedding and haunching as shown on the Plans for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which causes sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the **Contractor's** tamping and compaction equipment, intentional over-excavation due to the size of the **Contractor's** excavation equipment, or other reasons beyond the control of the **County** and the cost is borne by the **Contractor**.

D. Depth:

1. The trenches shall be excavated to the required depth or elevation that allows for the placement of the pipe and bedding to the dimensions shown on the Plans.

2. Where rock is encountered in trenches for pipelines, the **Contractor** shall excavate to the minimum depth that will provide clearance below the pipe barrel of 8 inches for pipe 21 inches in diameter and smaller and 12 inches for larger pipe and manholes. The **Contractor** shall remove boulders and stones to provide a minimum of 6 inches clearance between the rock and any part of the pipe, manhole, or accessory.

E. Excavated Materials:

1. Excavated materials shall be placed a minimum of 2 feet from the top edge of the open trench and may be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.

2. Excavated materials shall not be placed in public roadways. Excavated materials not used as backfill shall be immediately disposed of away from the site of the Work in accordance with the requirements of Section 02200 - Site Preparation.

3. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.05 SHORING, SHEETING, AND BRACING OF TRENCHES

A. The **Contractor** shall sheet and brace the trench as required by Federal, State, and local laws and regulations. Shoring, sheeting, and bracing shall be designed by a Registered Professional Engineer in the State of Georgia. OSHA standards shall be used to prevent caving during excavation in unstable material, or to protect adjacent structures, property, workers, and the public. The **Contractor** shall increase trench widths accordingly by the thickness of the sheeting. The **Contractor** shall maintain sheeting in place until the pipe has been placed and backfilled at the pipe zone. Shoring and sheeting shall be removed, as the backfilling is done, in a manner that will not damage the pipe or permit voids in the backfill. All sheeting, shoring, and bracing of trenches shall conform to the safety requirements of the Federal, State, or local public agencies having jurisdiction. The most stringent of these requirements shall apply.

B. Sheeting, bracing, and shoring shall be performed in the following instances:

1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.
2. In caving ground.
3. In wet, saturated, flowing, or otherwise unstable materials, the sides of all trenches and excavations shall be adequately sheeted, braced, and shored.
4. Where trenches and other excavations are within 10 feet from existing buildings and structures or where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees, or private properties, which are required to remain, whichever is more stringent.
5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.

C. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.

D. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.

E. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedures for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The **Contractor** shall provide closure and sealing between sheet piling and existing facilities.

F. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield shall be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe.

G. The **Contractor** shall remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. The **Contractor** shall leave sheeting in place when in the opinion of the **County** it cannot be safely removed or is within 3 feet of an existing structure, utility, or pipeline. The **Contractor** shall cut off any sheeting left in place at least 3 feet below the surface.

H. Sheet piling within 3 feet of an existing structure or pipeline shall remain in place, unless otherwise directed by the **County**.

I. If, in the opinion of the **County**, the material furnished for supporting excavation is not of the proper quality or sufficient size, or not properly placed to insure the safety of the Work or of adjacent structures or property, the **Contractor** shall, upon notice by the **County**, forthwith procure and place satisfactory supports, or place said supports in a satisfactory manner and upon his failure so to do, the **County** may order the **Contractor** to stop work until said notice has been complied with and without entitling the **Contractor** to any claim for extra compensation, damage, or delay.

J. When required by the **County**, a shoring plan shall be submitted by the **Contractor** for approval prior to construction of the particular portion of the Work.

K. All supports in excavations shall be withdrawn in stages on both sides of trenches (to prevent lateral movement of the pipe) as the backfilling is being done, except where, and to such extent as the **County** shall order, or where the **County** shall permit the same to be left in place, at the **Contractor's** expense and upon the **Contractor's** request. The **Contractor** shall cut off any sheeting

left in place, at least 3 feet below finished grade whenever ordered by the **County**.

3.06 TRENCH ROCK EXCAVATION

A. Rock excavation shall be performed in accordance with the requirements of Section 02316 - Rock Removal.

B. Definition of Trench Rock: Any material that requires drilling and blasting, and occupies an original volume of at least 1 cubic yard. Rock shall be considered as material that cannot be removed with a crawler tractor equal to a D-8 Caterpillar, equipped with a single-tooth ripper or by an excavator trackhoe equal to a Caterpillar 225 rated with a ¾-cubic-yard capacity with a bucket curling pullout capacity of 25,000 pounds.

C. Blasting: The **Contractor** shall exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. The **Contractor** shall provide licensed, experienced workmen to perform blasting. The **Contractor** shall conduct blasting operations in accordance with all existing ordinances and regulations and gain all required permits at their cost. The **Contractor** shall protect all buildings and structures from the effects of the blast. The **Contractor** shall repair any resulting damage. If the **Contractor** repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the **County** may direct the **Contractor** to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge at the **Contractor's** expense.

D. Disposal of Rock: The **Contractor** shall dispose of rock, off site, that is surplus or not suitable for use as rip rap or backfill in a lawful manner.

E. The **Contractor** shall notify the **County** prior to any blasting. Additionally, the **Contractor** shall notify the **County** and local fire department before any charge is set.

F. The **Contractor** shall employ an independent, qualified specialty sub-contractor, approved by the **County**, to: monitor the blasting by use of a seismograph; identify the areas where light charges must be used; conduct pre-blast and post-blast inspections of structures, including photographs or videos; and maintain a detailed written log.

3.07 DEWATERING EXCAVATIONS

A. Dewatering shall be performed in accordance with the requirements of Section 02140 - Dewatering.

B. The **Contractor** shall dewater excavations continuously to maintain a water level at least 2 feet below the bottom of the trench.

B. The **Contractor** shall control drainage in the vicinity of excavations so the ground surface is properly pitched to prevent water running into the excavation.

D. The **Contractor** shall maintain sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where pipes cross natural drainage channels, the Work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the Work shall be prevented. The **Contractor** shall make provisions for the satisfactory disposal of surface water to prevent damage to public or private property.

E. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete, or backfilling.

F. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least 2 feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump at least 2 feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operating.

G. The **Contractor** shall dewater trenches by use of a well point system when pumping from sumps does not lower the water level at least 2 feet below the trench bottom. Where soil conditions dictate, the **Contractor** shall construct well points cased in sand wicks. A casing of 6 to 10 inches in diameter shall be jetted into the ground, followed by the installation of the well point, filling the casing with sand, and withdrawing the casing.

3.08 TRENCH FOUNDATION AND STABILIZATION

A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.

B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and the **County** will then order trench stabilization by directing the **Contractor** to over-excavate the trench bottom and fill it with crushed stone.

C. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least 2 feet below the specified trench bottom. The **Contractor** shall place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching, and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.

D. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown on the Plans or specified otherwise in these Specifications.

3.09 BEDDING AND HAUNCHING

A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders, or large dirt clods.

B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Plans. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade and line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.

C. At each joint, the **Contractor** shall excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.

D. After the pipe section is properly placed, the **Contractor** shall add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked, or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders, or dirt clods.

E. Gravity Sewers and Accessories: The **Contractor** shall lay pipe with Class "B" bedding, unless otherwise shown on the Plans, specified in these Specifications, specified by the manufacturer, or directed by the **County**.

1. Class "A": The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall lay pipe to line and grade on concrete block. The **Contractor** shall place concrete to the full width of the trench and to a height of one-quarter of the outside diameter of the pipe above the invert.

2. Class "B": The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.

3. Class "C": The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The Contractor shall place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to a height of one-quarter (¼) the outside diameter of the pipe above the bottom of the pipe barrel.

4. Type 5: The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall place and compact bedding material to the proper

grade before installing pipe. After the pipe has been brought to the proper grade, haunching material shall be carefully placed by hand and compacted to the top of the pipe.

F. Manholes: The **Contractor** shall excavate to a minimum of 12 inches below the planned elevation of the base of the manhole. The **Contractor** shall place and compact crushed stone bedding material to the required grade before constructing the manhole.

G. Excessive Width and Depth:

1. Gravity Sewers: If the trench is excavated to excess width, the **Contractor** shall provide the bedding class with the next higher bedding factor. Type 5 Bedding may be used in lieu of Class "A" bedding, where Class "A" bedding is necessitated by excessive trench width.

2. If the trench is excavated to excessive depth, the **Contractor** shall provide crushed stone to place the bedding at the proper elevation or grade.

H. Compaction: Bedding and haunching materials under the pipe, manholes, and accessories shall be compacted to a minimum of 90 percent of the maximum dry density, unless shown or specified otherwise in these Specifications.

3.10 INITIAL BACKFILL

A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill, and ensure the uniform distribution of the loads over the top of the pipe.

B. The **Contractor** shall place initial backfill material carefully around the pipe in uniform layers to a depth of at least 12 inches above the pipe barrel. Layer depths shall be a maximum of 6 inches C. The **Contractor** shall backfill on both sides of the pipe simultaneously to prevent side pressures.

D. The **Contractor** shall compact each layer thoroughly with suitable hand tools or tamping equipment.

E. Initial backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless shown or specified otherwise in these Specifications.

3.11 CONCRETE ENCASEMENT FOR PIPELINES

A. Where concrete encasement is shown on the Plans for pipelines, the **Contractor** shall excavate the trench to provide a minimum of 12 inches of clearance from the barrel of the pipe. The **Contractor** shall lay the pipe to line and grade on solid concrete blocks or solid bricks. In lieu of bedding, haunching, and initial backfill, the **Contractor** shall place concrete to the full width of the trench and to a height of not less than 12 inches above the pipe barrel. The **Contractor** shall not backfill the trench for a period of at least 24 hours after concrete is placed.

3.12 FINAL BACKFILL

A. The **Contractor** shall backfill carefully to restore the ground surface to its original condition.

B. Except as specified otherwise in this section, the top 6 inches shall be topsoil obtained as specified in this section.

C. Excess excavated material and material that is unsuitable for backfilling shall be disposed of in accordance with the requirements of Section 02200 - Site Preparation.

D. If materials excavated from the trench are not suitable for use as backfill materials, the **Contractor** shall provide select backfill material conforming to the requirements of this section.

E. After initial backfill material has been placed and compacted, the **Contractor** shall backfill the trench with final backfill material. The **Contractor** shall place backfill material in uniform layers, compacting each layer thoroughly as follows:

1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack"

2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet

3. In 24-inch layers, if using a hydra-hammer

F. Settlement: If the trench settles, the **Contractor** shall excavate, re-fill, compact, and grade the surface to conform to the adjacent surfaces.

G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless specified otherwise.

3.13 ADDITIONAL MATERIAL

A. Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material shall be as shown on the Plans. The **Contractor** shall utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, the **Contractor** shall provide additional suitable fill material.

3.14 BACKFILL WITHIN RIGHTS-OF-WAY

A. The **Contractor** shall compact backfill underlying pavements and sidewalks, and backfill under dirt and gravel roads to a minimum 95 percent of the maximum dry density.

3.15 BACKFILL WITHIN GEORGIA DOT RIGHTS-OF-WAY

A. Backfill within the Georgia DOT rights-of-way shall meet the requirements stipulated in the "Utility Accommodation Policy and Standards," published by the Georgia Department of Transportation.

3.16 FLOWABLE FILL

A. Where flowable fill is required, and approved by the **County**, the **Contractor** shall excavate the trench to provide a minimum of 6 inches clearance on either side of the pipe barrel. The **Contractor** shall lay the pipe to line and grade on solid concrete blocks or bricks. In lieu of bedding, haunching, and initial backfill, the **Contractor** shall place flowable fill to the full width and depth of the trench.

B. Flowable fill shall be protected from freezing for a period of 36 hours after placement. Minimum temperature of flowable fill at point of delivery shall be 50 degrees F.

C. The **Contractor** shall provide steel plates over flowable fill in road locations.

3.17 COMPACTED GRANULAR MATERIAL

A. Where compacted granular material is required as initial and final backfill material, it shall be placed after bedding and haunching material specified elsewhere has been placed. Compacted granular material shall be compacted to a minimum 95 percent of the maximum dry density.

3.18 TESTING AND INSPECTION

A. The soils testing laboratory is responsible for the following:

1. Compaction tests in accordance with the requirements of this section.

2. Field density tests for each 2 feet of lift, one test site minimum between each pair of manholes, every one-hundred (100) feet within road rights-of-way, or more frequently if ordered by the **County**. The **County** will direct where density tests shall be performed along the site of the Work.

3. Inspecting and testing stripped areas, subgrades, and proposed fill materials.

B. The **Contractor's** duties relative to testing shall include the following:

1. Notifying laboratory of conditions requiring testing.

2. Coordinating with laboratory for field testing.

3. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.

4. Providing excavation as necessary for laboratory personnel to conduct tests at no cost to the **County**

C. Inspection:

1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill are subject to inspection by the **County**.

2. Foundations and shallow spread footing foundations shall be inspected by a **County** geotechnical specialist, who shall verify suitable bearing and construction.

D. The **Contractor** shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction.

3.19 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The **Contractor** shall dispose of excess excavated material, in accordance with the requirements of Section 02200 - Site Preparation. The **Contractor** shall make arrangements for the disposal and bear all costs of disposal.

+++ END OF SECTION 02324 +++

SECTION 02371
RIP RAP

PART 1 - GENERAL

1.01 SCOPE

A. Where shown on the Plans, specified in these Specifications, or directed by the **County**, the **Contractor** shall provide stone, sand-cement bag or grouted stone rip rap, including associated earthwork, geotextile filter fabric, crushed stone, and filter material, complete and in place. The type of rip rap material will be as indicated on the Plans or directed by the **County**.

B. Related Work Specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 02060 - Crushed Stone Aggregate
3. Section 02315 - Excavation and Backfill for Structures
4. Section 02324 - Trenching and Trench Backfilling
5. Section 02125 - Temporary and Permanent Erosion and Sediment Control

1.02 SUBMITTALS

A. Submittals 01300 shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Sect. In addition, the following specific information shall be provided:

1. Testing certificates from a qualified testing agency shall be submitted prior to acceptance of the rock source to verify conformity with the requirements of the Plans and these Specifications. The **Contractor** shall, if requested, coordinate inspection of the rock source with the **County**.

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
2. ASTM C535 - Standard Test Method for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
3. AASHTO T85 - Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate
4. AASHTO T210 - Method of Test for Aggregate Durability Index
5. AASHTO T134 - Optimum Moisture Content

6. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems

PART 2 - PRODUCTS

2.01 ROCK RIP RAP

A. Rock for rip rap shall be sound, dense, durable stones, or rock fragments, free from cracks, pyrite intrusions, and other structural defects. Stones that will be used with mortar shall be free from dirt, oil, or other material that might prevent good adhesion with the mortar. Stones with a laminated structure shall be avoided. Field stones shall not be used as a source of rock for rip rap. Only rock that has been approved by the **County** shall be used for rip rap.

2.02 STONES FOR RIP RAP

A. All stone for rip rap shall be sound, durable pieces of quarried stone weighing 156 pounds per cubic foot or more. The stone shall be angular and random in shape. Rounded boulders or cobbles shall not be used. Flat, slabby, or shaley pieces will not be acceptable. Stone shall be resistant to weathering and to water action and free from overburden, spoil, and organic material, and shall meet the gradation requirements of this section.

B. Rip rap shall be of the type indicated on the Plans and shall conform to the size types as follows:

1. Type 2: equivalent to GA DOT specification for “Plain Rip rap”:

Percent by Weight	Volume (cu.ft.)	Weight (lb.)	Diameter (in.)
65 – 100 %	0.75 – 2.0	125 - 320	15 – 24
10 – 65 %	0.04 – 0.75	7 - 125	5 – 15
0 – 10 %	0.0 – 0.04	0 - 7	0 – 15

2. Type 3: equivalent to GA DOT specification for “Dumped Rip rap – Type 3”:

Percent by Weight	Volume (cu.ft.)	Weight (lb.)	Diameter (in.)
65 – 100 %	0.10 – 1.0	17 – 65	6 – 18
10 – 65 %	0.01 – 0.1	2 – 17	2 – 6
0 – 10 %	0.0 – 0.01	0 - 2	0 – 2

C. Stones shall consist of durable, sound, hard, angular rock meeting the following requirements for durability absorption ratio, soundness test, and abrasion test:

Durability Absorption Ratio	Acceptability
Greater than 23	Passes
10 to 23	Passes only if Durability Index is 52 or greater
Less than 10	Fails
Durability Absorption Ratio =	Durability Index (Coarse) / % absorption + 1

D. The durability index and percent absorption shall be determined by AASHTO T 210 and AASHTO T 85, respectively. The minimum apparent specific gravity of the stones shall 2½ as determined by AASHTO T 85.

E. Stones shall have less than 10 percent loss of weight after five cycles, when tested per ASTM C88.

F. Stones shall have a wear not greater than 40 percent, when tested per ASTM C535.

G. Control of gradation shall be by visual inspection. The **Contractor** shall furnish a sample of the proposed gradation of at least 5 tons or 10 percent of the total rip rap weight, whichever is less. If approved, the sample may be incorporated into the finished rip rap at a location where it can be used as a frequent reference for judging the gradation of the remainder of rip rap. Any difference of opinion between the **County** and the **Contractor** shall be resolved by checking the gradation of two random truckloads of stones. Arranging for and the costs of mechanical equipment, a sorting site, and labor needed in checking gradation shall be the **Contractor's** responsibility.

H. The acceptability of the stones will be determined by the **County** prior to final placement.

2.03 SAND-CEMENT BAG RIP RAP

A. Portland Cement shall meet the requirements of State of Georgia Standard Specifications Construction of Transportation Systems, Section 830 - Portland Cement (reference AASHTO M85).

B. Fine Aggregate shall meet the requirements of State of Georgia Standard Specifications Construction of Transportation Systems, Section 801 - Fine Aggregate. The aggregate shall be composed of hard, durable particles, free from injurious amounts of organic impurities. The aggregate shall have no more than 20 percent passing the No. 200 sieve and the material passing the No. 10 sieve shall not be more than 7 percent clay.

C. Bags shall be of cotton, burlap, or fiber reinforced paper capable of containing the sand-cement mixture without leakage during handling or placing. Bags

previously used for sugar or any other material which will adversely affect the sand-cement mixture shall not be used. Capacity of bags shall not be less than ¾ cubic foot minimum nor more than 2 cubic feet maximum.

2.04 GEOTEXTILE FABRIC FILTER

A. Geotextile fabric shall meet the requirements of State of Georgia Standard Specifications Construction of Transportation Systems, Section 881 - Fabrics for woven fabrics, having physical properties as follows:

Tensile Strength – any direction (ASTM D 4634)	200 lbs
Bursting Strength (ASTM D 3786)	500 psi
Elongation Before Breaking (ASTM D 4634)	10 – 35%
Percent Open Area (GDT: 88)	4.0 – 6.0%

B. Fabric shall be Mirafi Filterweave 403 or approved equal.

2.05 STONE FILTER MATERIAL

A. Stone Filter material shall be clean and free from organic matter. It shall be crushed rock or gravel, durable, and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall conform to the following gradation (State of Georgia Standard Specifications Construction of Transportation Systems, Section 800 - Coarse Aggregate, No. 467 modified):

Size	Percentage Passing
2 inch	100
1½ inch	95-100
¾ inch	35-70
⅜ inch	10-30
No. 4 Sieve	0-10

PART 3 - EXECUTION

3.01 GENERAL

A. All slopes to be treated with rip rap shall be trimmed to the lines and grades indicated on the Plans or as directed by the **County**. Loose material shall be removed or compacted by the methods approved by the **County**.

B. Unless otherwise indicated on the Plans or directed by the **County**, stone rip rap shall not be placed on slopes steeper than the natural angle of repose of the rip rap.

3.02 **SURFACE PREPARATION**

A. Surfaces to receive filter materials and rip rap, including the toe trench and slope, shall be brought to the line and grade indicated on the Plans and shall be smooth and firm, free of brush, trees, stumps, and other objectionable material. Where filling of depressions is required or a filled bank is constructed, the new material shall be compacted with hand or mechanical tampers to a minimum of eighty-five (85) percent of maximum density.

B. Unless specifically approved by the **County**, rip rap shall be placed in dry conditions. The **Contractor** shall remove and exclude all stormwater, groundwater, and creek or stream water from the excavation. Sump pumps and sand bags or portable dams, diversions, or other approved means, shall be used to remove and exclude water and continuously maintain water level below the bottom of the excavation. Water shall be removed and excluded until both geotextile and stone filter material and rip rap have been placed. Any water removed from the excavation shall not be discharged into any surface stream or other water body unless such discharge meets water quality standards. Removed water may be disposed on-site by land application using sprinklers in an area designated by the **County** or by discharge into an approved treatment system.

C. Where the **County** approves for the toe trench to be constructed under water, the following construction practices, or approved equivalent practices, shall be observed:

1. The **Contractor** shall use a U.S. Army Corps of Engineers approved floating silt fence, or alternative approved method, surrounding the construction area to maintain adjacent water turbidity within applicable permit limits.

2. The **Contractor** shall measure the depth below water of the existing stream bed and submerged bank along the entire toe length, using a calibrated surveyor's rod or equivalent tool.

3. The **Contractor** shall then excavate material until the required trench section has been excavated. Confirmation that the required toe trench depth has been achieved shall be established by the **Contractor** through repeated measurement with the surveyor's rod.

4. In areas where the Plans show the use of geotechnical fabric or where directed by the **County**, geotextile fabric shall then be laid, as described in this section, and temporarily held in place until rip rap can be positioned to hold the fabric permanently.

5. In areas where the Plans show the use of stone filter material, or where directed by the **County**, stone filter material shall be placed to the specified thickness and leveled to the extent practical, using the surveyor's rod to verify required depth and level.

D. Cleared and excavated materials shall be hauled off site to an appropriate disposal location arranged by the **Contractor** and at its sole expense unless otherwise indicated on the Plans or specified in these Specifications.

E. Rip rap installed at the toe of a stream bank below the elevation of the water in a stream to prevent scour from undermining the rip rap shall be backfilled and covered with native soil to the original grade. The backfilled native soil shall be compacted with hand or mechanical tampers to a minimum of 80 percent of maximum density.

3.03 CREEK CROSSINGS

A. Rip rap shall be installed at all creek and storm drain crossings, at creek entrance into culverts or headwalls, where indicated on the Plans or required by the **County** in accordance with the Plans, Standard Details, or these Specifications. The dimensional width of the rip rap material at creek or storm drain crossings shall be equal to the trench width cut to install the pipeline plus 6 feet or as directed by the **County**. The method of installation shall be in accordance with the requirements of this section.

B. Installation of rip rap shall be kept up as closely as possible with the progress of pipe laying so as to perform the work in a uniform workmanlike manner.

3.04 PLACEMENT OF GEOTEXTILE FABRIC

A. The fabric shall be placed with the long dimension running up the slope, with the upstream strip overlapping the downstream strip. The **Contractor** shall use a minimum of 2-foot overlap for each overlap. The **Contractor** shall use a wider overlap if recommended by the geotextile manufacturer.

B. The fabric shall be placed loosely with sufficient folded or gathered material to prevent stretching and tearing during rip rap placement.

C. The fabric shall be anchored into place using securing pins with type and spacing as recommended by the manufacturer. In addition, the fabric shall be secured at the toe and crest of the slope using anchor trenches at least 2 feet deep. If a stream bank extends sufficiently above a stream such that rip rap would not be installed to the top of the bank, then the fabric shall be anchored in a 2-foot-deep trench up-slope from the top of the minimum free-board of ½ foot above the flow resulting from a 50-year, 24-hour storm runoff event.

3.05 PLACEMENT OF STONE FILTER MATERIAL

A. Stone filter shall be uniformly placed to a tolerance of plus or minus ½ inch and to a thickness of 12 inches for Type 2 rip rap and 8 inches for Type 3 rip rap.

B. Stone filter material shall be compacted to a minimum relative density of 80 percent.

3.06 CONSTRUCTION METHODS

A. All rip rap construction shall begin at the bottom of the slope and progress upward.

B. The **Contractor** shall place rip rap using methods and equipment approved by the **County**. The methods and equipment used to place rip rap shall be suitable for the class or type of rip rap involved. If the finished rip rap emplacement installed using the **Contractor's** method is not satisfactory, the **County** reserves the right to have it removed and replaced using hand placement methods and fresh stone.

C. Unless otherwise indicated on the Plans or directed by the **County**, plain rock rip rap shall be constructed using a crane and clam-shell or other suitable equipment approved by the **County**. The rock shall be placed as nearly as practicable in final position using powered equipment. If necessary, larger rocks shall be worked up to the surface when the material on the surface does not meet the weight specifications or when the voids next to the foundation material are too large.

D. The quantity of small stones shall be kept as low as possible, sufficient only to fill the voids between the larger stones. Care shall be taken to ensure that small stones are well distributed throughout the mass and not allowed to segregate or form pockets of small stone. All bridging shall be broken down. Large interstices, or open channels, or voids shall be filled by chinking or otherwise manipulating the stones.

E. When rip rap is to be built on existing rip rap, special care shall be taken to provide positive anchorage of the new rip rap to the existing rip rap.

F. The finished rip rap surface shall in general conform to the slope lines shown on the Plans. No objectionable, hazardous, or unsightly projections above the general plane surface will be permitted.

G. The main stones shall be thoroughly chinked and filled with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. This work shall continue with the progress of the construction. Tamping of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.

H. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case these stones shall be broken down to come within 4 inches of the normal surface.

3.07 SAND-CEMENT BAG RIP RAP

A. Fine aggregate and Portland cement shall be mixed at a maximum ratio of 5:1 by weight. The amount of water added shall be just enough to achieve optimum moisture content of the aggregate and cement, as determined by AASHTO T134.

B. The cement mixture shall obtain a minimum compressive strength of 500 psi in 7 days.

C. The bags shall be uniformly filled and tied in accordance with applicable permits. The bags shall be placed by hand with tied ends all facing the same direction.

D. The bags shall be packed against one another to produce the desired thickness and form a consolidated mass. Bags shall be placed to the elevation specified or indicated on the Plans to a tolerance of plus or minus 3 inches. After the bags are placed, the rip rap structure shall be kept wet by sprinkling or covering with wet material for at least 3 days. The sand-cement bags shall be protected from stream water or any disturbance during this curing period, and shall not be placed in freezing weather or when conditions are unfavorable for curing.

3.08 GROUTED RIP RAP

A. After the rip rap has been placed, the stones shall be thoroughly wetted before grouting. The spaces between the stones shall then be filled with a well-mixed grout composed of one part Portland cement and three parts of sand mixed with sufficient water to achieve a workable consistency. The grout shall be placed beginning at the toe and proceeding up the slope, and shall be finished by sweeping with a stiff bristle broom. After the grouting is completed, the structure shall be kept wet by sprinkling or covering with wet material for at least 3 days. The grout shall be protected from stream water or any other disturbance during this curing period, and shall not be placed in freezing weather or when conditions are unfavorable.

3.09 CLEANUP

A. After completion of the rip rap construction, the **Contractor** shall remove all debris and construction materials and equipment from the construction area and leave the entire construction area clean, neat, and in serviceable condition. The **Contractor** shall restore the construction area to the original or better condition in accordance with the requirements of Section 02920 - Site Restoration.

+++ END OF SECTION 02371 +++

SECTION 02485
SEEDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work covered by this section consists of furnishing all labor, equipment, and material required to place topsoil, seed, commercial fertilizer, agricultural limestone, and mulch material, including seedbed preparation, harrowing, compacting, and other placement operations on graded earthen areas as described herein and/or shown on the Drawings. In general, seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement, or sidewalks; all cleared or grubbed areas which are to remain as finish grade surfaces; and on all existing turf areas which are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these specifications.

B. The work shall include temporary seeding operations to stabilize earthen surfaces during construction or inclement weather and to minimize stream siltation and erosion. Temporary seeding shall be performed on any disturbed area left exposed for a period greater than 7 days.

C. Areas disturbed by construction activities, shall be restored to their original conditions with regard to surface grading, drainage, grass type (predominate), or other landscape features.

1.02 RELATED WORK

A. Section 02270 – Erosion and Sediment Control

B. Section 02486 – Sodding

1.03 QUALITY ASSURANCE

A. Prior to seeding operations, the **Contractor** shall furnish to the **County** labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the **Contractor** of any responsibility or liability for furnishing seed meeting the requirements of this section.

B. Prior to topsoil operations, the **Contractor** shall obtain representative samples and furnish soil test certificates including textural, pH, and organic ignition analysis from the State University Agricultural Extension Services or other certified testing laboratory.

1.04 ALTERNATE METHODS

A. The **Contractor** may propose alternate means and methods to establish a satisfactory coverage of healthy grass of the type required. The **Contractor** shall submit sufficient information to enable the **County** to assess the acceptability of the alternate approach.

PART 2 – PRODUCTS

2.01 TOPSOIL

A**.** The **Contractor** shall place a minimum of 4 inches of topsoil over all graded earthen areas and over any other areas to be seeded. The quality of topsoil shall be acceptable to the **County**.

B**.** Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than ½ inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and perennial weed seeds, and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.

C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam, or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than 5 percent nor more than 20 percent, by weight, of organic matter as determined by loss on ignition of oven-dried samples to 65°C.

2.02 SEED

A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U. S. Department of Agriculture Federal Seed Act.

B**.** All seed shall be from the last crop available at time of purchase and shall not be moldy, wet, or otherwise damaged in transit or storage.

C. Seed shall bear the grower's analysis testing to 98 percent for purity and 90 percent for germination. At the discretion of the Owner, samples of seed may be taken for check against the grower's analysis.

D. Species, rate of seeding, fertilization, and other requirements shall be as necessary to successfully establish the required stand of grass.

2.03 FERTILIZER AND LIMING MATERIALS

A. Fertilizer and liming materials shall comply with applicable state, local, and federal laws concerned with their production and use.

B. Commercial fertilizer shall be a ready mixed material of grade 18-46-0. Container bags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition.

C. Agricultural limestone shall be a pulverized limestone having a calcium carbonate content of not less than 85 percent by weight. Agricultural limestone shall be crushed so that at least 85 percent of the material will pass a No. 10 mesh screen and 50 percent will pass a No. 40 mesh screen.

2.04 MULCH MATERIAL

A. All mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.

B. Mulch shall be composed of wood cellulose fiber, straw, or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.

C. Wood-cellulose fiber mulch shall be as manufactured by Weyerhauser Company, Conway Corporation, or equal.

D. Straw mulch shall be partially decomposed stalks of wheat, rye, oats, or other approved grain crops.

E. Stalks shall be the partially decomposed, shredded residue of corn, cane, sorghum, or other approved standing field crops.

2.05 MULCH BINDER

A. Mulch on slopes exceeding a 3-to-1 ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life.

B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cutback asphalt binder shall be Grade RC 70 or RC 250.

2.06 INOCULANTS FOR LEGUMES

A. All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.07 WATER

A**.** Water shall be clean and clear, free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the **Contractor**.

PART 3 - EXECUTION

3.01 PLACING TOPSOIL

A. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed.

B. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.02 SEEDBED PREPARATION

A. Before fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line free from unsightly variation, bumps, ridges, and depressions, and all detrimental material, roots, and stones larger than 2 inches in any dimension shall be removed from the soil for non-residential and residential shall be hand racked to remove all detrimental material, roots, and stones

B. Not earlier than 24 hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than 2 inches with a weighted disc, tiller, pulvimixer, or other equipment, until the surface is smooth.

C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.

D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition.

3.03 FERTILIZATION AND LIMING

A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve an application rate of 80 pounds per acre.

B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of ½ inch.

C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.

D. Agricultural limestone shall be thoroughly mixed into the soil at a rate of 1 to 2 tons per acre. The specified rate of application of limestone may be reduced by the Owner if pH tests indicate this to be desirable. It is the responsibility of the

Contractor to obtain such tests and submit the results to the Owner for adjustment in rates.

E. The **Contractor** shall make one application of maintenance fertilizer at one-half the original rates applied in early spring following initial establishment of cover.

3.04 SEEDING

A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the periods shown below. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.

B. Seeds shall be uniformly sown by any approved mechanical method to suit the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder, or approved mechanical power drawn seed drills. Hydroseeding and hydromulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to present segregation of the various seeds in a seeding mixture.

C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8 inch by a cultipacker or suitable roller.

D. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

Seeding Requirements Table

The seed shall be a mixture as shown in Table 1, and shall be applied at the rates shown in the table:

Table 1		
Season	Type of Seed	Pounds Per Acre
Jan 1 – May 15	Unhulled Common Bermuda	45
	Kentucky 31 Fescue	300
	Rebel II Supreme	150
May 16 – Sept 1	Hulled Common Bermuda	75
Sept 2 – Dec 31	Unhulled Common Bermuda	45
	Kentucky 31 Fescue	300
	Rebel II Supreme	150

3.05 MULCHING

A**.** All areas to be seeded shall be uniformly mulched in a continuous blanket immediately after seeding when using Wheat straw at a minimum of 2 ½ tons per acre or equivalent to 2- to 4-inch thickness. The rate of application will correspond to a depth of at least 1 inch and not more than 1 1/2 half inches, according to the texture and moisture content of the mulch material. It is intended that mulch shall allow some sunlight to penetrate and air to circulate, at the same time shading the ground, reducing erosion, and conserving soil moisture. The **Contractor** shall take steps necessary to prevent loss of mulch or bunching of mulch as caused by the wind.

B. Mulch on slopes greater than a 3-to-1 ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt or cutback asphalt shall be applied at the approximate rate of 5 gallons per 1,000 square feet as required to hold the mulch in place.

C. The Contractor shall cover structures, poles, fence, and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.

D. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates.

3.06 WATERING

A. The **Contractor** shall be responsible for maintaining the proper moisture content of the soil to ensure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain an adequate water content in the soil. Water shall not be applied when there is danger of freezing. In the event that official watering bans or water restrictions are in effect, the Contract shall comply with applicable guidelines on watering for new grass.

B. Watering shall be accomplished by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.07 MAINTENANCE

A. Upon completion of seeding operations, the **Contractor** shall clear the area of all equipment, debris, and excess material and the premises shall be left in a neat and orderly condition.

B. The **Contractor** shall maintain all seeded area without additional payment until final acceptance of the work by the **County**, including any regrading, refertilizing, reliming, reseeding, remulching, and watering required. Seeding work shall be repeated on defective areas until the **County** is satisfied that a satisfactory uniform stand is accomplished Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired at the **Contractor's** expense by filling with topsoil, compacting, and repeating the seeding work.

3.08 VEGETATIVE STABILIZATION SCHEDULE

A. The **Contractor** shall stabilize disturbed areas as construction progresses. The time duration limitations for stabilization of disturbed areas by either temporary mulching (for 7 days or less), temporary grassing, permanent grassing, or permanent sodding shall be as specified in Section 02270 – Erosion and Sediment Control; however, unstabilized areas of the construction corridor shall not exceed 1,000 linear feet on sanitary sewer sewers or water mains installed with easements and 300 linear feet for all other projects. Stabilization with permanent vegetation is preferred unless seasonal limitations exist.

+++ END OF SECTION 02485 +++

SECTION 02486
SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Sodding shall consist of establishing certain critical areas with sod as designated on the drawings.

B. Areas disturbed by construction activities shall be restored to their original conditions with regard to surface grading, drainage, grass type (predominate), or other landscape features.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02000 – Site Work
B. Section 02125 – Temporary and Permanent Erosion and Sediment Control
C. Section 02750 – Bypass Pumping
D. Section 02486 – Seeding
E. Erosion and Sediment Control Plan

1.03 ALTERNATE METHODS

A. The **Contractor** may propose alternate means and methods to establish a satisfactory coverage of healthy grass of the type required. The **Contractor** shall submit sufficient information to enable the **County** to assess the acceptability of the alternate approach.

PART 2 - PRODUCTS

2.01 SOD

A. Sod shall consist of a live, dense, well-rooted growth of turf grass species as noted on the Drawings. The sod shall be free from Johnson grass, nut gras,s and other obnoxious grasses, of suitable character for the purpose intended and for the soil in which it is to be planted. It shall be uninjured at the time of planting.

B. Sod shall be uniform in thickness, having not over 2 inches or less than 1 inch of soil.

C. Sod strips shall have a consistent width of 12 or 18 inches.

2.02 FERTILIZER

A. Fertilizer (10-10-10) used in connection with sodding, shall contain 10 percent nitrogen, 10 percent phosphoric acid and 10 percent potash. The fertilizer shall be furnished in standard containers with the name, weight, and guaranteed

analysis of the contents clearly marked. The containers shall ensure proper protection in handling and transporting the fertilizer. All commercial fertilizer shall comply with local, state, and federal fertilizer laws.

B. Ammonium nitrate shall be a standard commercial product, shall conform to the requirements for other commercial fertilizers as specified above, and shall have a minimum of 33½ percent nitrogen.

2.03 LIME

A. Agricultural limestone shall contain not less than 85 percent of calcium carbonate and magnesium carbonate combined, and shall be crushed so that at least 85 percent will pass the No. 10 mesh sieve and 50 percent will pass a No. 40 mesh screen.

2.04 WEATHER LIMITATIONS

A. Sod shall be placed only when the soil is moist and favorable to growth. No placement shall occur unless weather and soil conditions are considered favorable for the successful establishment of the particular sod type being placed.

PART 3 EXECUTION

3.01 SODDING

A. The area to be sodded shall be constructed to the lines and grades indicated on the Drawings and the surface loosened to a depth of not less than 3 inches with a rake or other device. As applicable, clean, uniform topsoil shall be placed to provide a rich bed for root growth. If necessary, the area shall be sprinkled until saturated at least 1 inch in depth and kept moist until the sod is placed thereon. Immediately before placing the sod, the fertilizer shall be uniformly applied at the rate of 25 pounds of Grade 10-10-10, or equivalent, per 1,000 square feet. Agricultural limestone shall be applied at the rate of 100 pounds per 1,000 square feet.

B. The entire area shall be thoroughly covered with sod. Sod shall be placed on the prepared surface with edges in close contact and, as far as possible, in a position to break joints.

C. Sod shall be maintained moist from time of removal until reset but shall be placed as soon as practicable after removal from place where growing. Immediately after placing, it shall be rolled with a roller or hand tamped to the satisfaction of the **County**.

D. Sod on slopes steeper than 3 to 1 shall be held in place by wooden pins about 1 inch square and 6 inches long, driven through the sod into the soil until they are flush with the top of the sod.

3.02 WATERING AND MAINTENANCE

A. Sod shall be watered for a period of 2 weeks after which ammonium nitrate shall be applied at the rate of 3 pounds per 1,000 square feet and the sod given a final watering. Water shall not be applied when there is danger of freezing. In the event that official watering bans or water restrictions are in effect, the **Contractor** shall comply with applicable guidelines on watering for new grassing.

B. The **Contractor** shall not allow any equipment or material to be placed on any planted area and shall erect suitable barricades and guards to prevent his equipment, workers, or the general public from traveling over any area planted with sod.

C. It shall be the obligation of the **Contractor** to secure a satisfactory growth of grass before final acceptance of the project by the County

3.02 VEGETATIVE STABLIZATION SCHEDULE

A. The **Contractor** shall stabilize disturbed areas as construction progresses. The time duration limitations for stabilization of disturbed areas by either temporary mulching (for 7 days or less), temporary grassing, permanent grassing or permanent sodding shall be as specified in Section 02270 – Erosion and Sediment Control; however, unstabilized areas of the construction corridor shall not exceed 1,000 linear feet on sanitary sewer sewers or water mains installed within easements and 300 linear feet for all other projects. The permanent vegetative stabilization method is preferred unless seasonal limitations exist.

+++ END OF SECTION 02486 +++

SECTION 02490
TREES, SHRUBS AND GROUND COVERS

PART I - GENERAL

1.01 SCOPE

A. This Section includes furnishing all equipment, materials, and labor necessary for soil preparation; planting of trees, shrubs, ground cover, or vines as applicable; protection, maintenance, guarantee, and replacement of plants; and all related items necessary to restore the site after the construction work is completed.

B. Products and procedures specified in this section shall apply to the following job-specific conditions:

1. Replacement of trees, shrubs and ground covers removed or damaged as the result of construction activities. The nature and extent of replacement work will be as indicated on the Drawings and the cost of such work will be included in the Contract Price. Such replacement work may include: the relocation and re-installation of existing plant materials; the replacement of removed plants with new materials, matching quantities, species and arrangement; or a combination of these options.

2. Installation of new materials in accordance with prior agreements made with property owners, as described in the Easement Stipulations. The cost of this work shall be included in the Contract Price.

3. Additional installation of new materials at the direction of the **County** will be considered extra work and will be paid for in the Contract.

C. Related Work Specified Elsewhere

1. Section 02100 – Site Preparation
2. Section 02270 – Erosion and Sediment Control

1.03 EXISTING CONDITIONS

A. Before commencing any work required by this Section, the **Contractor** shall ascertain the location of all utilities, subsurface drainage, irrigation systems, and underground construction so that proper precautions may be taken not to disturb or damage any subsurface improvements. The **Contractor** will be held responsible for making, at his own expense, all repairs to damaged utilities, structures, and all associated damages resulting from the Work.

B. It is not contemplated that planting shall occur where the depth of soil over underground construction or obstructions is insufficient to accommodate the roots or where impervious soil will require drainage. Where such conditions are encountered in excavation of planting areas, other locations for the planting may be designated by the **County**.

C**.** Removal of underground obstructions, relocation of construction and provision of drainage for planting areas shall be done only as directed by the **County**.

D. If changes in the location of the work or if removal of obstructions involve additional work, the **Contractor** shall proceed in accordance with the "General Conditions" of the Contract for construction.

E. The **Contractor** shall take all necessary precautions during planting operations to avoid damage to existing sidewalks, fencing, paving, curbs, lighting, and other site improvements. Any damage that does occur shall be corrected to the **County's** satisfaction at the **Contractor's** expense.

F. The **Contractor** shall make a dimensional sketch of existing landscaped areas before such areas are disturbed, and shall use said sketch for layout during restoration of these areas. The Preconstruction Video and any still photographs taken prior to construction activities will also be used to verify the restoration work.

1.04 QUALITY ASSURANCE

A. All planting shall be performed by a company specializing in landscape development construction, particularly soil preparation, lawns, and live plant materials; with at least five years experience in such work. Evidence of this experience shall be provided, citing similar projects, prior to the initiation of the Work.

B. Size, quality, root ball preparation, and grading standards shall conform to the American Association of Nurserymen, Inc., as published in the "American Standard for Nursery Stock: ANSI 260.1, latest approved revision.

C. The **Contractor** shall be responsible for all certificates of inspection of plant materials that may be required by federal, state, or other authorities to accompany shipments of plants. All plants shall be inspected and approved by the **County** before they are planted. Inspection and approval of plants upon delivery shall be for quality, size, and variety only, and shall not in any way impair the right of rejection for failure to meet other requirements during progress of the work.

D. Fertilizer shall conform to the local, state, and federal laws applicable to its manufacture and labeling.

1.05 PLANT GUARANTEE AND REPLACEMENT

A. Guarantee - Plants shall be alive, healthy, and vigorous at the end of the Guarantee period. The guarantee period shall be at least one year and shall terminate at the end of the first full growing season. The first full growing season begins on April 1 after planting and ends on November 1.

B. Replacement - Any plant installed under this contract that is dead or not in satisfactory growth, will be removed from the site; these and any plants missing due to the **Contractor's** negligence shall be replaced as soon as conditions permit. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the **Contractor** shall notify the **County**

immediately in writing, and the **County** will determine acceptability. All replacement plants shall be guaranteed for the duration of one full growing season, as described in Paragraph 1.05A above.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil shall be natural, fertile, agricultural soil, capable of sustaining vigorous plant growth. It shall be of uniform composition without admixture of subsoil. It shall be free of stones (½ inch in diameter or larger), clods of hard earth, live plants, roots, sticks, or other extraneous matter harmful to plant growth.

1. Topsoil shall have an acidity range of ph. 6.0 to 6.5 and shall contain not less than 6 percent organic matter.
2. Topsoil shall be obtained from naturally well-drained areas that have never been stripped before.
3. Topsoil shall not be delivered in a frozen or muddy condition.

B. The commercial fertilizer shall be a complete formula, 6-12-12, and shall conform to the applicable state fertilizer laws. It shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer that is caked or otherwise damaged, making it unsuitable for use, will not be accepted.

C. Pine straw mulch shall be freshly baled straw capable of producing desired results and not contain excessive amounts of pine cones, branches or forest litter.

D. All mulch shall be clean, and free of weeds, moss, sticks, insects, and debris, and shall be satisfactory to the **County**.

E. Pre-emergent used shall be "Ronstar" or approved equal.

F. Pine bark shall be good quality commercial stock of ½" - 1" size pieces (mini-nuggets) or "Nature's Helper."

G. Lime shall be ground limestone with analysis showing not less than 85 percent total carbonates. Lime shall be delivered in original unopened containers. Any caked or hardened lime shall not be used.

H. Water shall be supplied by the **Contractor**, along with all necessary hose or other watering equipment required for installation and maintenance of plant materials.

I. Herbicide used shall be "Round-up" or approved equal.

2.02 PLANT MATERIALS

A. Plant materials used will depend on job-specific conditions, as follows:

1. Trees, shrubs, and ground covers removed or damaged as the result of construction activities shall be replaced with new materials of the same size and type, except; mature trees and shrubs shall be replaced in kind with the following minimum size requirements: trees, 2-inch caliper; shrubs, 2-gallon container; or

2. Plant materials will be of the size, type and quantity listed in the Easement Stipulations; or,

3. Plant materials will be as directed by the **County**.

B. Plant materials shall comply with State and Federal Laws relating to inspection for diseases and insect infestation.

C. Plant materials shall conform to American Standard Nursery Stock (May 2, 1989, ANSI 260.1-1986). Names shall conform to those given in Standardized Plant Names, 1942 Edition prepared by the American Joint Committee on Horticultural Nomenclature.

D. Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the plant list before pruning.

E. Plants shall be nursery grown unless otherwise specified.

F. Substitutions will be permitted only upon submittal of proof that the specified plant is not obtainable. A substitute of nearest equivalent size or variety will be used with equitable adjustment of Contract Price when approved in writing by the **County**.

G. Plants designated “B & B” in the plant list shall be adequately balled with firm natural balls of soil sized as set forth in the American Standard for Nursery Stock. Balls should be firmly wrapped with burlap or similar biodegradable material and bound with twine, or wire mesh. No balled plant shall be planted if the ball is cracked or broken during shipment or during the planting process.

H. Insofar as is practicable, all plant material shall be planted on the day of delivery. Plants that cannot be planted immediately upon delivery shall be protected from the sun and wind. B & B plants shall be covered with moist soil, mulch, or other acceptable material. B & B plants and container grown plants shall be shaded and well watered. Plants shall not remain unplanted for longer than 3 days after delivery.

I. Plants shown as container grown in the plant list shall have sufficient root to hold earth intact after removal from containers but without being root-bound.

J. Caliper of tree trunks shall be measured at the chest level of a 6-foot-tall person for trees up to and including 4-inch caliper size.

PART 3 - EXECUTION

3.01 TIME OF PLANTING

A. Planting operations shall be conducted immediately under favorable weather conditions in conformance to the seasonal restrictions as follows:

1. Deciduous Material: September 15 to June 15. Materials shall be in dormant condition if planted after November 1 and prior to April 1. Soil, plant material, and environmental conditions shall be suitable for planting.
2. Evergreen Materials: Spring: March 15 to June 15; Fall: September 1 to November 1.
3. Perennials: Spring: March 30 to June 30; Fall: September 1 to November
4. Annuals: In season.
5. Planting periods may be extended or reduced according to weather and soil conditions at the time. Preparations for planting may begin earlier than specified seasons, if approved.

B. At the option and on the full responsibility of the **Contractor**, planting operations may be conducted under unseasonable conditions without additional compensation; however, prior written approval shall be obtained from the **County** and the guarantee period shall remain as specified in Paragraph 1.054.A herein.

3.02 PRODUCT HANDLING AND STORAGE

A. Balled and burlapped plants shall be dug and prepared for shipment in a manner that will not damage roots or branches.

B**.** Protection After Delivery - The balls or roots of plants not planted immediately upon delivery shall be covered with moist soil or mulch, or other protection from drying winds and sun. All plants shall be watered as necessary, until planted. Balled plants shall not be lifted by the trunk of the plant.

3.03 TREES AND SHRUBS

A. Locations for all plants and outlines for planting areas shall be staked on the ground and shall be approved by the **County** before plants are set. Orientation of plants, foliage, and branching shall be approved before installation. Any adjustments in locations and/or outline shall be approved in writing by the **County**.

B. Care shall be exercised to have pits dug and soil prepared prior to moving plants to pits for planting. Circular pits with vertical sides shall be excavated for all plants. Diameter of planting pits shall be twice the diameter of the ball or root spread. The depth of the pits shall be sufficient to accommodate the ball or roots when the plant is set to finished grade allowing for six inches of topsoil in the bottom of the pit. The soil at the bottom of the planting pit shall be loosened to a depth of three inches and mixed with topsoil. Any rock, rubble, hard pan, or other underground obstruction shall be removed to permit proper installation and drainage. The Contractor shall assure positive drainage away from all planting beds.

C. Soil used in planting shall be a topsoil mixture. One cubic yard of pine bark “Nature's Helper” and twenty pounds of commercial 6-12-12 fertilizer or bone meal shall be mixed with every six cubic yards of topsoil.

D. Unless otherwise specified, all plants shall be planted in pits, centered, and set at a depth so that the finished grade level will be the same as that at which the plant was grown.

E. For balled and burlap material, all wire and string binding shall be removed from around the root ball. After placing the plant in the planting pit, the burlap shall be cut away or folded back from the top third of the root ball. If balled plants are wrapped with material that is not biodegradable, then this wrapping material shall be removed once the plant is set in the planting pit. Care shall be taken so not to damage the root system.

F. The pit shall be backfilled with topsoil placed in layers around the roots or ball. Each layer shall be carefully tamped to avoid air pockets. When the hole is approximately two-thirds full, water should be added. After the water has been absorbed, the hole shall be filled with topsoil and tamped lightly to grade.

G. A 4-inch mound of soil shall be formed around each plant to produce a saucer. On slopes an adequate shoulder shall be formed on the downhill side to hold water and avoid erosion.

H. Guying and Staking

1. Hose shall be two-ply reinforced hose not less than 3/8" inside diameter.
2. Wire shall be galvanized pliable, zinc-coated iron not less than No. 16 gage.
3. Turnbuckles shall be galvanized and have a three inch minimum lengthwise opening fitted with screw eyes. Three turnbuckles are required per tree planting.
4. Trees shall be supported immediately after planting. All trees shall be guyed or staked.
5. Guy wires shall consist of two twisted strands of wire encased in hose to prevent direct contact with bark of the tree. Guying shall be spaced equally about each tree. Guy wires shall be placed around the tree trunk or lower branches in a single loop at an angle or about 60 degrees or about two-fifths of the height of the tree. Guy wires shall be fastened to 2" x 2" x 30" wooden stakes driven to approximately six inches above the ground. Guy wires shall be tightened and kept taut by turn-buckles, or other approved methods.
6. Wood stakes to be used shall be uniform 2" x 2" pressure treated wood with one end sharpened. Stakes shall be not less than six feet in length.
7. Tree species less than 3' tall will require slash staking. Wood stakes used shall be uniform 2" x 2" pressure treated wood with one end sharpened. Stakes shall not be less than four feet in length.

I. All trees shall be wrapped with standard manufactured tree wrapping paper, brown in color. Tree trunks shall be wrapped spirally overlapping two (2) inches and shall be wound from the ground line to above the lowest main branches. The wrapping shall be securely tied in at least five places, including the top, middle, and bottom, with a jute twine not less than two-ply or other approved bio-degradable material.

J. A 4" layer of pine straw mulch and a pre-emergent such as “Ronstar” or equal shall be applied to all planting bed areas.

K. Plant beds containing ericaceous plants shall be top dressed with ordinary powdered sulfur at the rate of 3 pints per 100 square feet of area.

3.04 GROUND COVERS

A. Except as otherwise specified, the Contractor's work shall conform to accepted horticultural practices as used in the trade.

B. Planting areas shall be dug and soil for planting ready before plants are delivered.

C. Ground cover beds shall be prepared by thorough loosening of existing subgrade and by placement of a minimum of 4 inches of approved topsoil to conform to the final grade. Soil used in planting shall be topsoil mixed with one cubic yard of pine bark “Nature's Helper” and twenty pounds of commercial 6-12-12 fertilizer or bone meal with every six cubic yards of topsoil.

D. Pre-emergence weed control shall be applied in accordance with manufacturer's instructions.

E. All planting beds shall be mulched with a 2-inch layer of bark mulch prior to planting. Planting holes shall be dug through the mulch. Insure that roots are surrounded by soil below the mulch.

F. Biodegradable pots shall be crushed and non-biodegradable pots shall be removed prior to planting. The root systems of all potted plants shall be split or crumbled.

3.05 PRUNING AND REPAIR

A. Upon completion of the work under the contract, all new trees and shrubs shall have been pruned and any injuries repaired. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs. On all bruises or scars on the bark and cuts over 3/4 inch in diameter, the injured cambium shall be traced back to living tissue and removed; wounds shall be smoothed and shaped so as not to retain water; and the treated area shall be coated with shellac or a commercial tree wound dressing.

3.06 REUSE OF EXISTING PLANT MATERIALS

A. Where shown on the Drawings, or as allowed herein, in-situ plant materials may be removed and re-installed in lieu of replacement with new materials. Such reuse shall conform to the following conditions:

1. In those areas indicated on the Drawings, existing trees and shrubs shall be removed and re-installed. The arrangement or location of the re-installed materials may vary from existing conditions. The Contractor shall be responsible for removal, proper handling, temporary storage, re-installation, and maintenance for the existing materials; however, no guarantee of survival is required. The cost of this work shall be included in the Contract Price.

2. If conditions permit, the Contractor may, at his own risk, remove and re-install existing trees and shrubs as an alternate to replacement with new materials. The Guarantee and Maintenance requirements shall apply for re-installed existing materials in the same manner as for new materials. The Contractor shall obtain written concurrence from the County of his intention to reuse existing plant materials prior to the execution of the work.

3. In those areas indicated in the Easement Stipulations or shown on the Drawings, certain existing trees and shrubs may be removed and re-installed by the property owner. The Contractor shall provide prior written notification to the property owner (with copy to the County) advising of the schedule of construction and the required time frame for removal. If the Contractor proceeds with construction without providing the required prior notice, any materials that are damaged or destroyed shall be replaced in kind and quantity at the expense of the Contractor.

B. Trees and shrubs shall be dug with firm natural balls of earth of sufficient size and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant.

C. All plants shall be protected from drying action of the sun and wind during digging and after being dug, while in storage awaiting planting and while being transplanted. Heel plants or properly protect them with soil, wet peat moss or in a manner acceptable to the County.

D. All existing trees and shrubs shall be replanted promptly, preferably within 24 hours after removal, but in no case longer than 48 hours.

3.07 INSPECTION FOR ACCEPTANCE

A. Upon completion of all planting, and after receipt of written notification, inspection of the landscape work will be made by the County. Inspection of the work will be made again by the County during and at the end of the maintenance period.

3.08 MAINTENANCE

A. Maintenance shall begin immediately after each plant is planted and shall continue until all plants are accepted. Planting shall be protected and maintained by watering, fertilizing, and replanting as necessary, at the contractor's expense, for at least one full growing season following installation beginning April 1 and ending November 1. as specified in Paragraph 1.05.A herein.

+++ END OF SECTION 02490 +++

SECTION 02510
PAVEMENT REPAIRS

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals for installation of all pavement repairs; pavement replacement; surface preparation; asphaltic concrete placement; pavement milling; cleaning and protection and any other similar, incidental, or appurtenant pavement repair operation that may be necessary to properly complete the Work as shown on the drawings and as specified herein.

B.

C. Related Work specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 02315 - Excavation and Backfill for Structures
3. Section 02920 - Site Restoration
4. Section 03300 - Cast-In-Place Concrete

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements within Section 01300, Submittals, of the Contract Documents. In addition, the following specific information shall be provided:

1. The **Contractor** shall submit asphalt mix design to the **County** for approval.

2. Certificates: The **Contractor** shall submit certification of quality control and compliance with the requirements of this section to the **County**. Certificates shall be signed by asphalt and concrete producers and the **Contractor**.

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. ASTM C94 - Standard Specification for Ready Mix Concrete

2. ASTM C33 - Standard Specification for Concrete Aggregates

3. ASTM C150 - Standard Specification for Portland Cement

4. ACI 301 - Specifications for Structural Concrete.

5. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete

6. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement

7. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement

8. ASTM C494 - Chemical Admixtures for Concrete

9. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction

10. ASTM D3371 - Standard Specification for Viscosity-Graded Asphalt Cement for use in Pavement Construction

11. ASTM D946 - Standard Specification for Penetration Graded Asphalt Cement for use in Pavement Construction

12. AI (Asphalt Institute) - MS-2- Mix Design Methods for Asphalt Concrete and Other Hot Mix Types

13. AI (Asphalt Institute) - MS-3- Asphalt Plant Manual

14. AI (Asphalt Institute) - MS-8- Asphalt Paving Manual

15. AI (Asphalt Institute) - MS-19 - Basic Asphalt Emulsion Manual

16. AASHTO M147-65 - Materials for Aggregate and Soil Aggregates

17. ASTM C-136 - Sieve Analysis of Fine and Coarse Aggregates

18. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition

B. The **Contractor** shall perform the Work in accordance with the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

C. The **Contractor** shall obtain materials from the same source throughout the duration of the paving Work.

D. The **Contractor** shall use only materials that are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete and is a GDOT approved facility.

1.04 PERFORMANCE REQUIREMENTS

A. The **Contractor** shall comply with the performance standards and requirements established by the Georgia Department of Transportation.

B. Paving: Pavement shall be designed for movement of trucks up to 60,000 pounds.

C. General: In addition to other specified conditions, the **Contractor** shall comply with the following minimum requirements:

1. Finished asphaltic concrete courses shall be compacted to the following densities:

a. Asphaltic Concrete Hot Mix Surface Course: Not less than 92 percent of theoretical density.

b. Asphaltic Concrete Hot Mix Binder Course: Not less than 90 percent of theoretical density.

2. On the day following placement of asphaltic materials, samples for the determination of in-place density shall be taken from the finished pavement. The **Contractor** shall core the samples at locations and in the manner directed by the **County**. The cuts made in taking such samples shall be repaired by the **Contractor** at no expense to the **County**.

3. The finished surface, when checked with a ten-foot straightedge placed parallel to the centerline, shall show no variation more than ¼ inch for base and intermediate courses, and not more than $^{1}/_{8}$ inch for surface courses. All testing will be made in a longitudinal direction at intervals as directed by the **County**. Surface deviations for intermediate courses may be corrected by skin patching, feather-edging, or other methods that would provide the required smoothness and maintain quality material. However, surface deviations for surface courses shall be corrected in such a manner as to maintain a quality pavement having the same uniform texture and appearance as the adjoining surface. All corrective work shall be performed at the expense of the **Contractor**.

1.05 REGULATORY REQUIREMENTS

A. The **Contractor** shall conform to applicable codes for paving work on public and private properties.

1.06 JOB CONDITIONS

A. Weather Limitations:

1. The **Contractor** shall apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least 40 degrees F.

2. The **Contractor** shall not conduct paving operations when the surface is wet, frozen, or contains excess moisture that would prevent uniform distribution and required penetration.

3. The **Contractor** shall construct asphaltic courses only when atmospheric temperature in the shade is above 35 degrees F, when the underlying base is dry, and when weather is not rainy.

4. The **Contractor** shall place base course when air temperature is above 35 degrees F and rising. The **Contractor** shall not place the base course on a frozen or muddy subgrade.

B. The **Contractor** shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

C. Traffic Control:

1. The **Contractor** shall maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

2. In addition, the **Contractor** shall provide flagmen, barricades, and warning signs for the safe and expeditious movement of traffic through construction zones within public rights-of-way, in accordance with the requirements of Section 01550 - Traffic Regulation.

1.07 TEMPORARY ROADWAY PAVING REPAIRS

A. The Contractor shall install temporary cold or permanent hot asphalt patching for both transverse and longitudinal roadway cuts upon completing backfilling requirements at the end of each day's work if the road is to be opened for local traffic while work has stopped.

B. It shall be the **Contractor's** responsibility to maintain the temporary paving in such condition as to prevent hindrance or hazard to traffic. When final paving is undertaken, the temporary surfacing materials shall be removed to accommodate final paving of types and thicknesses as specified in this section, the edges of the existing paving shall be neatly and uniformly trimmed, and the permanent pavement shall be placed.

C. Steel Plate Bridging:

1. At the **County's** discretion, steel plate bridging may be used. The **Contractor** must adhere to the following chart with respect to minimum plate size and thickness.

Trench Width	Minimum Plate Thickness
10" (0.25 m)	½" (13 mm)
1'-11" (0.58 m)	¾" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.60 m)	1 ¼" (32 mm)
*For trench widths greater than 5' 3", the **County** will determine the plate thickness.	

2. Steel plates used for bridging shall extend a minimum of 12 inches beyond all edges of the trench.

3. For traffic speeds less than 45 mph, the surrounding pavement shall be cold planed to a depth equal to that of the steel plate selected.

4. For traffic speeds greater than 45 mph, approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two dowels pre-drilled into the corners of the plate and drilled 2 inches into the pavement. Subsequent plates shall be butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope 8½ percent with a minimum 12 inches taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of asphalt concrete mix, concrete slurry, or an equivalent slurry that is satisfactory to the **County**.

5. Steel plates shall not be left on the road in any one location for more than 14 days.

D. Graded Aggregate Base:

1. Temporary patch paving using graded aggregate base shall be placed only as approved and directed by the **County**. All compacted material shall conform closely enough to the existing road surface so as to permit safe travel.

2. Graded aggregate may consist of gravel, air cooled blast furnace slag, crushed stone, or synthetic aggregate having hard, strong, durable pieces free of adherent coatings, and shall be approved for use by the **County**.

1.08 SOURCE QUALITY CONTROL

A. The **Contractor** shall submit the proposed mix design of each class of mix to the **County** for review prior to commencement of the Work.

B. The **County's** independent testing laboratory shall test samples in accordance with TAI MS.

1.09 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with the requirements of the General Conditions.

B. The **County's** independent testing laboratory shall take samples and perform tests in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.10 PROTECTION

A. Immediately after placement, the **Contractor** shall protect pavement from mechanical injury for 7 days.

PART 2 - PRODUCTS

2.01 FLEXIBLE PAVEMENT

A. Aggregates for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

B. Asphaltic cement for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

C. Bituminous prime coat shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

D. Bituminous tack coat shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

E. Hot Mix asphaltic concrete construction shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

2.02 RIGID PAVEMENT

A. Concrete and reinforcing bars (where required) for rigid pavement shall conform to the requirements of Section 03200 - Concrete Reinforcement and Section 03300-Cast-In-Place Concrete. Concrete for pavement shall be Class A.

2.03 CURB AND GUTTER

A. Concrete for curb, curb and gutter, or valley gutter shall be Class A. Concrete shall conform to the requirements of Section 03300 - Cast-In-Place Concrete.

2.04 SIDEWALKS

A. Concrete for sidewalks shall be Class A conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

2.05 DRIVEWAYS

A. Concrete for driveways shall be Class A conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

2.06 STANDARD GRANITE CURB, GRADE B

A. Curbs shall be furnished in standard lengths of 8 feet to the extent possible, employing shorter lengths where required such that the minimum length

employed shall not be less than 4 feet long. Curb sections shall have a split face and split top. Each joint shall have an unreinforced concrete footing as specified in the Detail Drawings. On wheelchair ramps and driveways, the granite curb shall continue through depressed sections of these elements as shown in the Detail Drawings. On curve section of roadway, the granite curb shall be split or cut on the curve.

2.07 SPECIALTY BRICK PAVER REPLACEMENT

A. The **Contractor** shall verify the size, type, color, and pattern of the existing specialty brick pavement surface prior to removal. The **Contractor** shall submit to the **County** for review the proposed replacement brick paver material and installation information. Materials shall conform to the existing installation for pattern, color, and size.

2.08 SPECIAL BRICK SIDEWALK REPLACEMENT

A. All brick shall be solid pavers conforming to the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, Latest Edition. The **Contractor** shall submit to the County for review the brick to be used to replace brick sidewalks within the Project area. Materials shall conform to the existing installation for pattern, color, and size.

2.09 STAMPED HEXAGONAL CONCRETE PAVERS

A. Where existing hexagonal concrete pavers must be removed to allow pipe installation, the **Contractor** may replace them with poured-in-place concrete sidewalk with stamped paver pattern as shown in the Standard Details.

2.10 PAVEMENT MARKINGS

A. This work shall consist of furnishing and applying thermoplastic reflectorized pavement marking compound that is extruded or sprayed on the pavement by mechanical means and which, upon cooling to pavement temperature, produces a reflectorized pavement marking.

B. Pavement markings shall be placed to reconstitute the markings that were existing before the pavement was milled for resurfacing. All final markings shall meet the requirements of the Manual of Uniform Traffic Control Devices (MUTCD). If any existing markings did not meet the MUTCD requirements or were absent, the **Contractor** shall nevertheless upgrade the markings at these locations to meet the MUTCD requirements. Thermoplastic traffic stripe shall consist of solid or broken (skip) lines, words and/or symbols of the type and color as shown in the MUTCD Manual. Short lines, such as crosswalks, stop bars, arrows, symbols, and crosshatching, shall be extruded. All other lines shall be sprayed.

C. Materials shall meet the requirements of Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition, Section 653.02.

D. Pavement markings shall include, but not be limited to, the following:

1. Double solid yellow center line.
2. Solid white pavement edge line where street does not have curb and to mark bike lanes.

3. Skip yellow lines to designate lanes in multi-lane streets.

4. Traffic stripe shall be 6 inches wide on Georgia Department of Transportation streets and County streets designated as arterial. Traffic stripe shall be 4 inches wide on all other streets.

5. White crosshatched lines for crosswalks at schools and at intersections.

6. White stop bars at stop streets.

7. Symbols such as turn arrows, one way arrows, etc.

8. Wording such as “STOP,” “SCHOOL,” etc.

9. All other striping, symbols, and wording required by MUTCD.

PART 3 - EXECUTION

3.01 PAVEMENT REPLACEMENT

A. The **Contractor** shall obtain prior approval from the **County** for any paving subcontracts.

B. The **Contractor** shall replace all pavements following the guidelines established by the Georgia Department of Transportation and other authorities having jurisdiction.

C. Where paved streets, sidewalks, driveways, and gutters are removed within the construction limits as specified, such replacement shall be paid for at the respective unit prices in the Bid Form. Such pavements removed or damaged by the **Contractor** beyond the specified construction limits shall be replaced in accordance with these specifications at the **Contractor's** expense.

D. Where chert, gravel, slag, or other unpaved street or driveway surfaces are removed or damaged, they shall be replaced with the same type of materials that were removed as an incidental part of the Work and no specific payment shall be allowed. Unpaved drives shall be topped with gravel at no additional cost to the **County**.

E. In replacing pavements and unpaved surfaces, the materials used and the construction methods shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

F. Where shown on the Plans, service lines and small diameter pipes, 8 inches in diameter or less located across paved surfaces shall be installed by boring or other approved methods that will not require cutting or removing the pavement where feasible. This shall be approved by the **County**.

G. All concrete pavement replaced shall not be less than 4 inches thick or equal to the original if greater than 4 inches.

H. Pavements replaced shall be of the same type of construction as was removed, except that no asphalt surface replaced shall be less than 3 inches thick consisting of a binder and seal coat. Wearing surfaces shall be slag sealed in accordance with the requirements established by the Georgia Department of Transportation.

3.02 SURFACE PREPARATION

A. Graded Aggregate Base Course:

1. The **Contractor** shall check subgrade for conformity with elevations and section immediately before placing aggregate base material.

2. The **Contractor** shall place aggregate base material in compacted layers not more than 6 inches thick, unless continuing tests indicate that the required results are being obtained with thicker layers.

3. In no case shall more than 8 inches of compacted base be placed in one lift.

4. The **Contractor** shall spread, shape, and compact all aggregate base material deposited on the subgrade during the same day.

5. The compacted base shall have sufficient stability to support construction traffic without pumping and meet minimum contract compaction specifications.

6. If compacted base becomes unstable as a result of too much moisture, the base material and underlying subgrade, if necessary, shall be dried or removed and reworked to a moisture content that can be recompacted to meet minimum contract compaction specifications at the expense of the **Contractor**.

B. Loose and Foreign Material:

1. The **Contractor** shall remove loose and foreign material from the surface immediately before application of paving.

2. The **Contractor** shall use power brooms or blowers, and hand brooming as required.

3. The **Contractor** shall not displace surface material.

C. Prime Coat:

1. The **Contractor** shall uniformly apply at a rate of 0.20 to 0.50 gallon per square yard over compacted and cleaned subbase surface.

2. The **Contractor** shall apply enough material to penetrate and seal, but not flood the surface.

3. The **Contractor** shall allow material to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than 24 hours unless otherwise acceptable to the **County**.

4. The **Contractor** shall blot excess asphalt with just enough sand to prevent pick-up under traffic.

5. The **Contractor** shall remove loose sand before paving.

D. Tack Coat:

1. The **Contractor** shall dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and similar surfaces.

2. The **Contractor** shall apply at a rate of 0.05 to 0.15 gallons per square yard of surface.

3. The **Contractor** shall apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.

4. The **Contractor** shall allow surfaces to dry until material is at a condition of tackiness to receive pavement.

3.03 EQUIPMENT

A. The **Contractor** shall provide size and quantity of equipment to complete the work specified in this section within the Project Schedule.

B. Bituminous pavers shall be self-propelled that spread hot asphalt concrete mixtures without tearing, shoving, or gouging surfaces, and control pavement edges to true lines without use of stationary forms.

C. Rolling equipment shall be self-propelled, steel-wheeled, and pneumatic-tired rollers that can reverse direction without backlash.

D. The **Contractor** shall provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the Work specified in this section.

3.04 ASPHALTIC CONCRETE PLACEMENT

A. The **Contractor** shall place asphalt concrete mix on prepared surfaces, spread, and strike-off using paving machine.

B. The **Contractor** shall spread the asphaltic concrete mixture at a minimum temperature of 225 degrees F.

C. Inaccessible and small areas may be placed by hand.

D. The **Contractor** shall place each course at a thickness such that when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated in the Plans.

E. Pavement Placing:

1. Unless otherwise directed by the **County**, the **Contractor** shall begin placing asphaltic concrete along the centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.

2. After first strip has been placed and rolled, the **Contractor** shall place succeeding strips and extend rolling to overlap previous strips.

3. The **Contractor** shall complete base courses for a section before placing surface courses.

4. The **Contractor** shall place the asphaltic concrete mixture in as continuous an operation as practical.

F. Hand Placing:

1. The **Contractor** shall spread, tamp, and finish the asphaltic concrete mixture using hand tools in areas where machine spreading is not possible, as acceptable to **County**.

2. The **Contractor** shall place the asphaltic concrete mixture at a rate that will ensure handling and compaction before mixture becomes cooler than acceptable working temperature.

G. Joints:

1. The **Contractor** shall carefully make joints between old and new pavements, or between successive days work, to ensure a continuous bond between adjoining work.

2. The **Contractor** shall construct joints to have the same texture, density, and smoothness as adjacent sections of asphalt concrete course.

3. The **Contractor** shall clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.

4. The **Contractor** shall offset transverse joints in succeeding courses not less than 24 inches.

5. The **Contractor** shall cut back edge of previously placed course to expose an even, vertical surface for full course thickness.

6. The **Contractor** shall offset longitudinal joints in succeeding courses not less than 6 inches.

7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, the **Contractor** shall cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

3.05 ASPHALTIC CONCRETE COMPACTION

A. The **Contractor** shall provide sufficient rollers to obtain the required pavement density.

B. The **Contractor** shall begin rolling operations as soon after placing as the mixture will bear weight of roller without excessive displacement.

C. The **Contractor** shall not permit heavy equipment, including rollers, to stand on the finished surface before it has thoroughly cooled or set.

D. The **Contractor** shall compact the asphaltic concrete mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

E. The **Contractor** shall start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. The **Contractor** shall roll to slightly different lengths on alternate roller runs.

F. The **Contractor** shall not roll centers of sections first under any circumstances.

G. Breakdown Rolling:

1. The **Contractor** shall accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and the outside edge.

2. The **Contractor** shall operate rollers as close as possible to paver without causing pavement displacement.

3. The **Contractor** shall check crown, grade, and smoothness after breakdown rolling.

4. The **Contractor** shall repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.

H. Second Rolling:

1. The **Contractor** shall follow breakdown rolling as soon as possible, while the asphaltic concrete mixture is hot and in condition for compaction.

2. The **Contractor** shall continue second rolling until the asphaltic concrete mixture has been thoroughly compacted.

I. Finish Rolling:

1. The **Contractor** shall perform finish rolling while the asphaltic concrete mixture is still warm enough for removal of roller marks.

2. The **Contractor** shall continue rolling until roller marks are eliminated and the course has attained specified density.

J. Patching:

1. The **Contractor** shall remove and replace defective areas.

2. The **Contractor** shall cut-out and fill with fresh, hot asphalt concrete.

3. The **Contractor** shall compact by rolling to the specified surface density and smoothness.

4. The **Contractor** shall remove deficient areas for full depth of course.

5. The **Contractor** shall cut sides perpendicular and parallel to direction of traffic with edges vertical.

6. The **Contractor** shall apply tack coat to exposed surfaces before placing the new asphaltic concrete mixture.

3.06 PAVEMENT MILLING

A. In street areas where pavement replacement occurs, pavement milling shall be performed by the **Contractor** to eliminate excessive buildup of pavement. The depth of milling shall be 1-1/2 inches from curb to curb, measured at each edge of pavement or as directed by the **County**.

3.07 CLEANING AND PROTECTION

A. Cleaning: After completion of paving operations, the **Contractor** shall clean surfaces of excess or spilled asphalt materials to the satisfaction of the **County**.

B. Protection:

1. After final rolling, the **Contractor** shall not permit vehicular traffic on asphaltic concrete pavements until it has cooled and hardened, and in no case no sooner than 6 hours.

2. The **Contractor** shall provide barricades and warning devices as required to protect pavement and the general public.

C. Maintenance: The **Contractor** shall maintain the surfaces of pavements until the acceptance of the Work. Maintenance shall include replacement, overlaying, milling, and reshaping as necessary to prevent raveling of the road material, the preservation of smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the **County**.

3.08 STANDARD GRANITE CURB, GRADE B

A. This work shall consist of furnishing and installing the standard granite curb where indicated in the Plans or directed by the **County**. In general, granite curb shall match existing granite curb that has been removed or damaged in the progress of the Work.

B. When existing granite curb will conflict with pipe installation, the **Contractor** shall carefully remove, clean, and store the granite curb. The **Contractor** shall remove damaged granite curb from the job site. Granite curb that is acceptable to the **County** may be re-installed.

C. Installation of standard granite curb, Grade B, shall include saw cutting existing asphalt concrete pavement a minimum of 1 inch and removing remaining pavement to subgrade, excavation of base and subgrade as necessary to install the granite curbing and backfilling and compacting of the installation.

3.09 SPECIALTY BRICK PAVER REPLACEMENT

A. This work shall consist of replacing existing brick pavement required to be removed for installation of sanitary sewers or connection of services.

B. Existing brick pavers removed to accommodate sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the pavement as shown on the Plans. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Replacement construction shall match the existing pavement section, including the concrete base slab.

3.10 SPECIAL BRICK SIDEWALK REPLACEMENT

A. This work shall consist of replacing existing brick sidewalks required to be removed for connection of services or for installation of sanitary sewers.

B. Existing brick sidewalk removed to accommodate the sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the sidewalk or driveway on a line perpendicular to the street. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Brick pavers shall be laid on a 4-inch-thick concrete base slab and meet the same requirements as Standard Concrete Sidewalk 4 inches thick.

3.11 STAMPED HEXAGONAL CONCRETE PAVERS

A. This work shall consist of replacing existing hexagonal concrete pavers required to be removed for connections of services or for installation of sanitary sewers.

B. Existing hexagonal pavers removed to accommodate the sanitary sewers or services or damaged by the Work shall be removed the full width of the sidewalk or driveway on a line perpendicular to the street. The stamped hexagonal concrete pavers shall be constructed according to the Standard Detail. Prior to beginning construction of the first section of stamped pavers, the Contractor shall construct a 4-foot-by-4-foot test panel for approval by the County. A standard concrete sidewalk 4 inches thick shall be poured. When the concrete has achieved sufficient set, the paver pattern imprint shall be created by pushing the form into the concrete to the specified depth and then carefully removing the form. If the constructed stamped pavers do not conform to the test panel, the unsatisfactory sections shall be removed and reconstructed by the **Contractor** to the satisfaction of the **County** without additional cost to the **County**.

3.12 PAVEMENT MARKINGS

A. Construction of pavement markings shall be performed according to the requirements of Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition, Section 653.03.

+++ END OF SECTION 02510 +++

SECTION 02521
CONCRETE SIDEWALKS, CURBS AND GUTTERS

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for construction of concrete sidewalks, concrete curb, concrete gutter and concrete combined curb and gutter, which shall consist of monolithic curb and gutter respectively, all constructed of Portland cement concrete, at the locations, and to the lines, grades, cross section, form and dimensions indicated on the Drawings.

B. Cement concrete sidewalks, concrete curb, gutter and combined curb and gutter shall include all necessary excavation, unless otherwise indicated, and subgrade preparation; backfilling, and final clearing up; and completion of all incidentals thereto, as indicated on the Drawings or as directed by the County.

C. Related Work Specified Elsewhere:

1. Section 02000, Site Work
2. Section 02112, Route Clearing
3. Section 02510, Paving Repair
4. Section 03200, Concrete Reinforcement and Doweling
5. Section 03300, Cast-In-Place Concrete

1.02 PRODUCT HANDLING

A. Protection: Use all means necessary to protect concrete materials before, during, and after installation and to protect the installed work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the **County** at no additional cost to the **County**.

1.03 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

A. Concrete reinforcement shall conform to Section 03200, Concrete Reinforcement and Dowelling.

2.02 CONCRETE AND RELATED MATERIALS

A. General: Concrete and related materials including, but not necessarily limited to, joint materials, membranes and curing compounds shall conform to Section 03300, Cast-In-Place Concrete.

B. Class: All concrete shall be Class B 3,000 psi and conform to requirements of Section 03300.

C. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, wastewater, and/or organic matter.

D. Admixtures shall meet the following requirements:

1. Except as herein specified, no curative or hardening admixtures shall be used.
2. An air entrainment agent capable of providing 3 to 6 percent air shall be used. Air entraining admixtures which are added to concrete mixtures shall conform to ASTM C 260 for Air Entraining Admixtures for Concrete.

F. Sub-base shall be constructed of durable material such as bank-run gravel. Minimum depth of sub-base shall be 3 inches.

G. Joint filler shall be a non-extruding joint material conforming to AASHTO M21 3 for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types). The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint unless otherwise specified by the **County**.

PART 3 - EXECUTION

3.01 EARTHWORK

A. General: All earthwork shall be performed in accordance with Section 02200, Earthwork, and as specified in this Section.

B. Backfilling

1. After the subgrade for sidewalks is compacted and at the proper grade, spread 3 inches or more of sub-base material. Sprinkle with water and compact by rolling or other approved method. The top of the compacted gravel shall be at the proper level to receive the concrete.
2. After the concrete has set sufficiently, the spaces on both sides of the curb, gutter, and combined curb and gutter shall be backfilled, and the materials shall be compacted and left in a neat and workmanlike condition.
3. Curbs to be used in the construction of asphalt pavements shall be backfilled prior to placement of base material for asphalt pavement.

3.02 SUBGRADE PREPARATION

A. The subgrade shall be formed by excavating to the required depth below the finished surface of the respective types, in accordance with the dimensions and designs indicated on the Drawings or as directed by the **County**, and shall be of such width as to permit the proper installation and bracing of forms. The subgrade shall be compacted by hand tamping and all soft, yielding, or unsuitable material shall be removed and backfilled with satisfactory material and again compacted thoroughly to 98 percent of dry density per ASTM 698 and finished to a smooth and unyielding surface. The finished grade shall be to the dimensions and design indicated on the Drawings or as directed by the **County** for the bottom of the proposed construction.

3.03 CONCRETE CURB AND GUTTER CONSTRUCTION

A. Construct curbs to lines and grade shown or established by the **County**. Curbs shall conform to the details shown on the Drawings.

B. Forming:

1. Forms shall be metal and of an approved section. They shall be straight, free from distortions, and shall show no vertical variation greater than □-inch in 10 feet, and shall show no lateral variation greater than ¼-inch in 10 feet from the true plane surface on the vertical face of the form.
2. Forms shall be of the full depth of the structure and be constructed so as to permit the inside forms to be securely fastened to the outside forms.
3. Securely hold forms in place true to the lines and grades indicated on the Drawings.
4. Wood forms may be used on sharp turns and for special sections as approved by the **County**.
5. Where wooden forms are used, they shall be free from warp and the nominal depth of the structure.
6. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
7. The supply of forms shall be sufficient to permit their remaining in place at least 12 hours after the concrete has been placed.

C. Joints:

1. Construct joints as indicated on the Drawings and as specified.
2. Construct joints true to line with their faces perpendicular to the surface of the structure and within ¼ inch of their designated position.
3. Thoroughly spade and compact the concrete at the faces of all joints to fill all voids.
4. Install expansion joint materials at the point of curve at all street returns.
5. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
6. Place contraction joints every 10 feet along the length of the curbs and gutters.
7. Form contraction joints using steel templates or division plates that conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove

them while the forms are still in place.

8. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or shall be notched to permit the reinforcement to be continuous through the joint.
9. Contraction joints shall be a minimum of 1-1/2 inches deep.

D. Finishing:

1. Strike off the surface with a template, and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius indicated on the Drawings.
3. Finish edges with an approved finishing tool having a 1/4-inch radius.
4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.

E. Concrete Curing:

1. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound specified in Section 03300, Cast-In-Place Concrete.
2. The compound shall be applied in one or two applications as directed by the **County**. When the compound is applied in two increments, the second application shall follow the first application within 30 minutes.
3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer as approved by the **County** at the rate directed by the **County**, but not less than 1 gallon per 200 square feet of surface.
4. The equipment shall provide adequate stirring of the compound during application.
5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the **County**.

F. Protection:

1. Provide and use sufficient coverings for the protection of the concrete in case of rain or breakdown of curing equipment.
2. Provide necessary barricades and lights to protect the work and rebuild or repair to the approval of the **County**. All damage caused by people, vehicles, animals, rain, the **Contractor's** operations, and the like shall be repaired by the **Contractor** at no additional expense to the **County**.

3.04 SIDEWALK CONSTRUCTION

A. Sidewalks shall be 4 inches thick.

B. At locations where the new sidewalk is to abut existing concrete, the **Contractor**

shall sawcut concrete for a depth of 2 inches and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk.

C. Joint:

1. Place preformed asphalt expansion joints as in the adjacent curb, where the sidewalk ends at the curb, and around posts, poles, or other objects protruding through the sidewalk.

2. Provide contraction joints transversely to the walks at locations opposite the construction joints in the curb. These joints shall be straight and at right angles to the surface of the walk.

D. Finishing:

1. Broom the surface with a fine-hair broom at right angles to the length of the walk and tool all edges, joints, and markings. Mark the walks transversely with a jointing tool.

E. Concrete Curing

1. After the finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound specified in Section 03300, Cast-In-Place-Concrete.
2. The compound shall be applied in one or two applications as directed by the **County**. When the compound is applied in two increments, the second application shall follow the first application within 30 minutes.
3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer as approved by the **County** at the rate directed by the **County**, but not less than 1 gallon per 200 square feet of surface.
4. The equipment shall provide adequate stirring of the compound during application.
5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the **County**.

F. Protection:

1. Protect the sidewalks from damage for a period of 7 days.
2. All damage caused by people, vehicles, rain, animals, or the **Contractor** shall be repaired by the **Contractor** at no additional expense to the **County**.

3.05 REPLACEMENT CONCRETE CURB AND SIDEWALK

A. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distances shown on the Drawings.

B. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4 inches. The new work shall be neatly jointed to the existing concrete so that the surfaces of the new work shall form an even, unbroken plane with the existing surfaces.

C. All work shall conform to the requirements for new sidewalks and curbs as detailed in this Section.

3.06 CLEANING

A. All excess or unsuitable material shall be disposed of as specified in Section 02050, Demolition.

B. All surfaces of the Work and adjacent surfaces shall be broom clean. The **Contractor** shall use pressure washing and other means approved by the **County** to remove splashed and spilled concrete from the Work and adjacent surfaces.

C. Disturbed seeded areas shall be reseeded per requirements of Section 02933, Seeding.

+++ END OF SECTION 02521 +++

SECTION 02622
PVC PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to install, in all locations under and outside of structures as shown on the Drawings, and test all buried PVC piping, PVC fittings, and appurtenances as specified herein.

1.02 RELATED WORK

A. Section 02100: Site preparation

B. Section 02200: Earthwork

C. Section 02230: Granular Material

D. Section 02640: Valves and appurtenances

E. Section 02930: Hydroseeding

F. Division 3: Concrete work

G. Division 15: Non-buried PVC pipe and fittings

H. Division 15: Piping pertaining to HVAC and plumbing

1.03 DESCRIPTION OF SYSTEMS

A. PVC pipe and PVC fittings shall be suitable for use in transporting chemicals.

B. PVC pipe and PVC fittings shall be furnished and installed in the locations shown on the Drawings.

1.04 QUALIFICATIONS

A. PVC pipe and PVC fittings shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished.

B. PVC pipe and PVC fittings shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.05 SUBMITTALS

A. Submit to the **County,** in accordance with Section 01300, copies of all materials required to establish compliance with this Section. Submittals shall include at least the following:

1. Piping layouts in full detail.

2. Locations and types of piping restraints, thrust blocks, or other devices to prevent pipe movement, vibration, and/or joint separation.

3. Large -cale details of fabricated fittings.

4. Schedules of all pipe, fittings, special castings, couplings, expansion joint, restrained joints, and other appurtenances.

5. Product data on pipe, fittings, couplings, harnesses, expansion joints, gaskets, fasteners, and other accessories.

6. Brochures and technical data on coatings and linings and proposed methods for application and repair.

7. A tabulated laying schedule that references stationing and invert elevations as shown on the Drawings, as well as all fittings, bevels, restrained joints, outlets, tees, bends, adapters, closures, and specials. The laying schedule shall show pipe class, class coding, station limits, and transition stations for various pipe classes.

8. Design data as further described below.

9. The above shall be submitted to the **County** for approval before manufacture and shipment. The locations of all pipes shall conform to the locations indicated on the Drawings. Pipe shall not be supplied from inventory.

B. Submit anticipated production and delivery schedule.

C. Test Reports

1. Factory test results

2. Field pressure/leakage tests

3. Prior to shipment of pipe, submit certified affidavit of compliance stating that the pipe for this project was manufactured, inspected, and tested in accordance with the American Water Works Association (AWWA) and American Society for Testing and Materials (ASTM) standards specified herein.

1.06 REFERENCE STANDARDS

A. Design, manufacturing, and assembly of elements of the products herein specified shall be in accordance with the standards of the below listed organizations.

1. ASTM

a. ASTM D1784 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
b. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining

Plastic Pipe

c. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

2. AWWA

a. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in (75mm through 1200mm) for Water and Other Liquids

b. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

c. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

d. AWWA C651 - Disinfecting Water Mains

e. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-in through 12-in for Water Distribution

f. AWWA C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-in through 36-in

3. National Sanitation Foundation (NSF)

a. Standard No. 14 - Plastic Piping Components and Related Materials

b. Standard No. 61 - Drinking Water System Components - Health Effects

4. Where reference is made to a standard of one of the above, or other organizations, the version of the standard in effect at the time of bid opening shall apply.

1.07 QUALITY ASSURANCE

A. All PVC pipe and fittings shall be from a single manufacturer. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034. In addition, all PVC pipe to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by the **County**. The **Contractor** shall require the manufacturer's cooperation in these inspections. The cost of plant inspection of all pipe approved for this Contract, plus the cost of inspection of a reasonable amount of disapproved pipe, will be borne by the **County**. Final payment will be reduced by excessive costs of plant inspection of pipe, and **Contractor** shall have no claim thereto. Excessive inspection costs are defined as the costs of inspection of that amount of pipe that exceeds 125 percent of the aggregate length of each type installed.

B. Inspections of the pipe may also be made by the **Contractor** after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.08 SYSTEM DESCRIPTION

A. The pipe and fittings specified herein are intended to be of standard types for use in transporting chemicals and leachate from packaged odor control systems.

1.09 DELIVERY, STORAGE AND HANDLING

A. All items shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the **County.**

B. PVC items deteriorate in sunlight and are slightly brittle, especially at lower temperatures, so care shall be taken in loading, transporting, and unloading items to prevent injury to the items. All items shall be examined before installation and no piece shall be installed if found to be defective. Handling and installation of pipe and fittings shall be in accordance with the manufacturer's instructions and referenced standards, and as specified herein.

C. Any pipe or fitting showing a crack or that has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

D. While stored, pipe shall be adequately supported from below at not more than 3-foot intervals to prevent deformation. The pipe shall be stored in stacks no higher than those given in the following table:

Pipe Diameter (inches)	Max. No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2
54 and larger	1

E. Pipe and fittings shall be stored in a manner that will keep them at ambient outdoor temperatures and out of the sunlight. Temporary shading as required to meet this requirement shall be provided. Simple covering of the pipe and fittings that allows temperature buildup or direct or indirect sunlight will not be permitted. Coverings shall be as recommended by the manufacturer.

F. If any defective item is discovered after it has been installed, it shall be removed and replaced with an exact replacement item in a satisfactory manner by the **Contractor**, at the **Contractor's** expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until testing.

G. In handling the items, use special devices and methods as required to achieve the results specified herein. No uncushioned devices shall be used in handling the item.

PART 2 PRODUCTS

2.01 MATERIALS

A. PVC pipe shall be manufactured from rigid, unplasticized, PVC and CPVC compound meeting ASTM D-1784, Type 1, Grade 1 (Class 12454-B) and manufactured in accordance with ASTM D-1785. The pipe shall have a design stress rating of 2,000 psi at 73 degrees F and shall be suitable for field cutting and solvent welding. Pipe shall be of the sizes as shown on the Drawings and shall be Schedule 80 unless otherwise shown.

B. PVC joints and fittings for chemical shall be the socket type for solvent welded joints conforming to ASTM D-2467 and D-2466, using solvent as specified in ASTM D-2564, except where threaded or flanged connections are shown on the Drawings. Threaded connections shall conform to ASTM D-2464 and shall be compatible with the pipe where installed. Flanges shall be furnished with 1/8-inch-thick full-faced gaskets. Flange bolts and nuts shall be ASTM A276, Type 304 or 316 stainless steel. Flanges shall be threaded or socket welded to pipe ends, shall be true 90 degrees with the pipe axis, and shall conform to ANSI 150-pound design.

C. Fittings, specials, unions, and flanges shall be of the same schedule number and manufactured of the same materials as the pipe. Gaskets in PVC pipe shall be of a material suitably resistant to the fluid within the respective pipes and shall be subject to the approval of the **County**.

D. Expansion joints shall have integral duck and rubber flanges. They shall have individual solid steel ring reinforcement with a carcass of highest grade woven cotton or acceptable synthetic fiber. Joints shall be constructed of pipeline size and to meet working pressures and corrosive conditions similar to the line where installed. They shall be of a filled arch-type construction with a minimum of three arches per joint. All joints must be finished-coated with Hypalon paid to prevent ozone attack. They shall be Style 500 as manufactured by Mercer Rubber Co. of Trenton, New Jersey, or equal.

E. All PVC pipe installed above ground shall contain an ultraviolet light inhibitor.

F. Sleeve couplings for plastic pipe shall be Dresser style 38 or 138 or equal.

G. Plastic tubing shall be clear, flexible, non-cracking with a wall thickness that is adequate for the pressures involved and of the sizes as shown on the Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. The installation of PVC pipe and fittings shall be strictly in accordance with the manufacturer's technical data and printed instructions.

B. Joints for PVC pipe and fittings shall be solvent welded except for flanged or threaded pipe where required. In making solvent welded connections, clean dirt and moisture from pipe and fittings, bevel pipe ends slightly with emery cloth, if necessary, and apply solvent cement of the proper grade.

C. Installation of valves and fittings shall be strictly in accordance with manufacturer's instructions. Particular care shall be taken not to overstress threaded connections at sleeves. In making solvent weld connections, the solvent shall not be spilled on valves or allowed to run

from joints.

D. All exposed piping shall have a sufficient number of unions to allow convenient removal of piping.

E. Where plastic pipe passes through wall sleeves, joints shall be sealed with a mechanical, modular rubber sealing element placed in between the sleeve and the pipe and expanded to make a tight fit - Link Seal or equal.

F. All PVC pipe to metal pipe connections shall be made using flanged connections. Metal piping shall not be threaded into plastic fittings, valves, or couplings, nor shall plastic piping be threaded into metal valves, fittings, or couplings.

G. PVC pipe shall be bedded to 1 foot above the top of the pipe and thereafter backfilled as specified in Section 02200.

H. Pipe Identification

1. All PVC mains shall be identified by 2-inch-wide self-adhesive taping along the crown of the pipe.

2. The tape shall indicate the contents of the pipe.

3. The **Contractor** shall apply the tape after the pipe has been installed in the trench.

4. In all cases where PVC pipe is installed, a 6-inch-wide metallic tape shall be buried directly over the centerline of the pipe and the tape shall be between one and two feet above the top of the pipe. The tape shall read “Caution – [Indicate contents of the pipe]” and shall be 1.5-inch letters.

5. Pipe identification shall be as manufactured by Thor Enterprises Inc. or equal.

3.02 TESTING

A. All pipes containing solvent welded joints shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipes shall be subjected to a hydrostatic pressure test for 2 hours at 100-psi pressure unless otherwise directed or approved and shall show zero leakage for solvent welded joints. Gasketed joint leakage shall be as allowed in AWWA C600. Provide suitable restrained plugs and caps as required to complete the hydrostatic testing specified. All leaks shall be repaired and pipes retested. Prior to testing, the pipe shall be supported and braced or blocked in an approved manner to prevent movement during tests.

B. Gravity pipes shall be subjected to either hydrostatic pressure test as specified in AWWA C600 or low-pressure air test, or exfiltration test as specified in Section 306-1.4 of Standard Specifications for Public Works Construction, latest edition.

C. All valves and valve boxes shall be properly located and installed and operable prior to testing. Plugs and caps shall be provided in sufficient number for filling and draining the pipe and for venting air.

D. The **County** will make available a source of supply from the existing water distribution facilities for **Contractor's** use in filling pipelines for testing. An air break shall be maintained at all times between the **County's** system and the **Contractor's** equipment to prevent cross-connection. The line shall be slowly filled with water and the specified test pressure shall be maintained in the pipe for the entire test period by means of a pump furnished by the **Contractor**. Provide accurate means for measuring the quantity of water required to maintain this pressure. The amount of water required is a measure of the leakage.

E. The duration of the pressure test shall not be less than 2 hours. The leakage test shall be a separate test following the pressure test and shall not be less than 2 hours duration. All leaks evident at the surface shall be repaired and leakage eliminated regardless of the total leakage as shown by test. Pipes that fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced.

F. Water required by the **Contractor** for testing will be provided by the **County** at standard billing rates for the volume required.

G. The **Contractor** shall submit a plan for testing to the **County** for review at least 10 days before starting the test.

H. Where pipes are to be pressure tested, but are not specifically required to have restrained joints, the **Contractor** shall calculate the test pressure thrusts and provide one of the following restraint methods to restrain pipe joints during testing:

1. Restrained joints as specified.

2. Restrained mechanical joint glands.

3. Concrete thrust blocks of a size calculated by the **Contractor's** engineer. The engineer shall be registered in the State of Georgia. This shall be submitted to the **County** for approval.

4. Temporary mechanical thrust restraint.

5. Use push-on joint gaskets with locking elements formed into the gaskets such as American Fast-Grip Gaskets.

3.03 CLEANING

A. At the conclusion of the work, thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. All debris shall be removed from the pipe. The lowest segment outlet shall be flushed last to ensure debris removal.

END OF SECTION

SECTION 02665
WATER MAINS AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. The work included under this section covers all labor, materials, equipment, tools, and incidentals required for a complete installation of water mains and accessories as shown on the Plans and as specified in this section.

B. The **Contractor** shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), Steel Structures Painting Council (SSPC), and other recognized standards. Latest revisions of all standards shall be applicable.

C. Galvanized pipe/fittings shall not be used as any part of the Water Transmission and Distribution System, nor shall galvanized materials be used to join any appurtenances to the System.

D. Water mains, valves, hydrants, and appurtenances shall be installed before the installation of the subbase course or paving or any other utilities except sanitary sewer lines.

E. Related Work Specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 01550 – Traffic Regulation
3. Section 02200 - Site Preparation
4. Section 02205 - Dewatering
5. Section 02315 - Excavation and Backfill for Structures
6. Section 02324 - Trenching and Trench Backfilling
7. Section 02700 – Pavement Repairs
8. Section 02710 - Concrete Curbs and Sidewalks
9. Section 02920 – Site Restoration

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. Complete product data and engineering data, including shop drawings.
2. Documentation that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least 2 years.
3. Written certification to the **County** that all products furnished comply with all applicable requirements of these Specifications.

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. ANSI A21.4 (AWWA C104) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids
2. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings
3. ANSI B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
4. ANSI B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes
5. ASTM B32 - Standard Specification for Solder Metal
6. ASTM B88 - Standard Specification for Seamless Copper Water Tube
7. ASTM C150 - Standard Specification for Portland Cement
8. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials
9. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings
10. AWWA C104 (ANSI A21.4) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids
11. AWWA C110 (ANSI A21.10) - Ductile Iron and Gray Iron Fittings, 3-in. through 48-in., for Water and Other Liquids
12. AWWA C111 (ANSI A21.11) - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
13. AWWA C115 (ANSI A21.15) - Flanged Ductile Iron Pipe with Threaded Flanges
14. AWWA C150 (ANSI A21.50) - Thickness Design of Ductile Iron Pipe
15. AWWA C151 (ANSI A21.51) - Ductile Iron Pipe, Centrifugally Cast for Water and Other Liquids
16. AWWA C153 (ANSI A21.53) - Ductile Iron Compact Fittings, 3-in. through 24-in. and 54-in. through 64-in., for Water Service
17. AWWA C600 - Installation of Ductile Iron Water Mains and their Appurtenances
18. AWWA C606 - Joints, Grooved and Shouldered Type
19. AWWA C651 - Disinfecting Water Mains
20. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning
21. Other ANSI, ASTM and AWWA specifications referenced herein

1.04 TRANSPORTATION AND HANDLING

A. Unloading: The **Contractor** shall furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves, and accessories. The **Contractor** shall make equipment available at all times for use in unloading. The **Contractor** shall not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.

B. Handling: The **Contractor** shall handle pipe, fittings, valves, and accessories carefully to prevent shock or damage. The **Contractor** shall handle pipe by

rolling on skids, forklift, or front end loader. The **Contractor** shall not use any material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.05 STORAGE AND PROTECTION

A. The **Contractor** shall store all pipe that cannot be distributed along the route. The **Contractor** shall make arrangements for the use of suitable storage areas.

B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

D. Stored mechanical and push on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first in, first out basis.

E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.06 WATER MAIN LOCATION

A. The minimum depth of cover shall be 4 feet and the maximum cover shall be five 5 feet. Any deviations shall be specifically approved by the **County**.

B. The installation of a water main parallel to another utility in the same vertical plane is not permitted; that is, “stacking” of utilities is not permitted.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE

A. Ductile iron pipe shall be manufactured in accordance with the requirements of AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Plans. All pipe shall have a minimum pressure rating as indicated in the Table 1, and corresponding minimum wall thickness, unless otherwise shown on the Plans, specified in these Specifications, or approved by the **County**.

Table 1	
Pipe Diameter (inches)	Pressure Class (psi)
4 – 12	350
14 – 18	350
20	300
24	250
30 – 54	200
60 – 64	200

D. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer.

E. Ductile Iron Pipe and fittings shall be cement lined in accordance with the requirements of AWWA C104. A seal coat over the cement lining is not required. Pipe and fittings shall be furnished with a bituminous outside coating.

F. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.

G. Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47, ASTM A197, or ANSI B16.3

H. Unless otherwise specified, steel fittings and appurtenances shall conform to the requirements of ASTM A234, ASTM A105, or ANSI B16.11; and fabricated steel fittings and appurtenances shall conform to the requirements of AWWA C208.

I. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to the requirements of ASTM A536 or malleable iron conforming to the requirements of ASTM A47. Standard steel fittings, including large-size elbows, shall be forged steel conforming to the requirements of ASTM A106. Standard segmentally welded fittings shall be fabricated of Schedule 40 carbon steel pipe.

J. Joints:

1. Unless shown or specified otherwise, joints for ductile iron pipe shall be push on or restrained joint type for pipe and standard mechanical, push on, or restrained joints for fittings. Push on and mechanical joints shall conform to the requirements of AWWA C111.

2. The only acceptable restrained joint systems for ductile iron pipe are identified in Table 2 unless approved by the **County**. No field welding of restrained joint pipe will be allowed.

Table 2 – Acceptable Restrained Joints				
Diameter (inches)	ACIPCO	U.S. Pipe	McWane	Generic[1]
4 – 12	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 – 24	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 – 36	Flex Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 – 48	Lok-Ring	TR Flex	N/A	MJ with Retainer Gland
54 – 64	Lok-Ring	TR Flex	N/A	N/A

[1] Fittings and valves only, and only where specifically allowed.

3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet.

4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

K. The **Contractor** shall provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of ⅛ inch thick, cloth-reinforced rubber; gaskets may be ring type or full-face type.

L. Bolts and Nuts:

1. The **Contractor** shall provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with the requirements of ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.

2. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low alloy steel in accordance with the requirements of ASTM A242 to the dimensions shown in AWWA C111/ANSI A21.11.

3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to the requirements of ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.

4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to the requirements of ASTM A307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to

ASTM A 563. Zinc plating shall conform to the requirements of ASTM B633, Type II.

5. Bolts for submerged service shall be stainless steel machine bolts conforming to the requirements of ASTM A193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to the requirements of ASTM A194, Grade 8.

M. Mechanical joint glands shall be ductile iron.

N. Welded Outlet: Welded outlets may be provided in lieu of tees or saddles on mains with a diameter greater than or equal to 24 inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 [Pressure Class 350 for 60- and 64-inch sizes]. The welded outlet shall be rated for two hundred and fifty (250) psi working pressure. Each welded outlet shall be hydrostatically tested at 500 psi. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in Table 3.

Table 3

Parent Pipe Diameter (inches)	**Maximum Outlet Diameter (inches)**
24	16
30	20
36	24
42	30
48	30
54	30
60	30
64	30

O. Ductile iron pipe shall be encased with polyethylene film where shown on the Plans. Polyethylene film shall be in accordance with the requirements of AWWA C105.

P. Thrust collars shall be welded on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.

Q. Acceptance will be on the basis of the **County's** inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

2.02 PIPE LINING

A. Cement Mortar: Unless otherwise specified, pipe and fittings shall be lined with cement mortar as specified in AWWA C205. Fittings and specials larger than 24 inches not fabricated from centrifugally lined straight sections, shall require 2 inches by 4 inches by 13-gage self-furring wire mesh reinforcement for hand-applied lining.

2.03 PIPE COATING

A. Epoxy: Unless otherwise specified, pipe and fittings shall be coated with a liquid epoxy as specified in AWWA C210 with the following requirements:

1. No coal tar products shall be incorporated in the liquid epoxy.
2. The curing agent may be an amidoamine as well as other curing agents listed in AWWA C210
3. The coating shall be applied to a minimum thickness of 16 mils in not less than two coats.

B. Polyethylene tape: Where shown on the Plans or directed by the **County**, pipe and fittings shall be coated and wrapped with prefabricated multi-layer cold applied polyethylene tape coating in accordance with the requirements of AWWA C214. The coating application shall be a continuous step operation in conformity with the requirements of AWWA C214, Section 3. The total coating thickness shall be not less than 50 mils for pipe 24 inches and smaller and not less than 80 mils for pipe 26 inches and larger.

2.04 FUSION EPOXY COATING AND LINING

A. Where shown on the Plans or directed by the **County**, steel pipe and fittings shall be fusion epoxy coated and lined. The fusion epoxy coating shall be 3M Scotchkote 203, or equal, approved by the **County**. Surface preparation shall be in accordance with the requirements of SSPC-SP 10 near white blast cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.

B. Field welds, connections, and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 306.

2.05 COPPER PIPE

A. Pipe shall be rolled copper tubing, ASTM B 88, Type K.

B. Where required, sweat to screw adapters shall be cast bronze ANSI B16.18, wrought solder joint ANSI B16.22. Unions shall be cast bronze or bronze with solder connections. Joints shall be made with 95/5 solder for Type K pipe.

2.06 PIPING APPURTENANCES

A. Retainer Glands:

1. Retainer glands shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400 or equal, as manufactured by Ford Meter Box Company.

2. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants and other locations as shown on the Plans.

B. Hydrant Tees: Hydrant tees shall be equal to ACIPCO A10180 or U.S. Pipe U 592.

C. Anchor Couplings: Lengths and sizes shall be as shown on the Plans. Anchor couplings shall be equal to ACIPCO A 10895 or U.S. Pipe U 591.

D. Hydrant Connector Pipe: The connector pipe shall be ductile iron meeting the requirements of AWWA C153. It shall have a 24-inch offset design so that the hydrant can be adjusted to ensure placement at the proper grade. It also shall have an anchoring feature at both ends so that when used with M.J. split glands, a restrained joint is provided. It shall be cement-lined in accordance with AWWA C104 and equal to the Gradelok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.

E. Tapping Saddles: Tapping saddles are not allowed unless approved by the **County**.

F. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, “Caution Water Line Buried Below.” Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2 inches when buried less than 10 inches below the surface. Tape width shall be a minimum of 3 inches when buried greater than 10 inches and less than 20 inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

2.07 FIRE HYDRANTS

A. General: Fire hydrant shall be a two-piece standpipe and stem, compression shutoff, dry-barrel type. Fire hydrant shall conform to the requirements of AWWA C502 and shall be listed by Underwriters Laboratories, Inc. in accordance with the requirements of UL 246.

B. Acceptable Products: Fire hydrants shall be American Valve and Hydrant B-62-B, M & H 129T, Mueller Super Centurion 250-AWB, A-423, Kennedy K81A, U.S. Metropolitan 250, or equal approved by the **County**.

C. Product Data: The following information shall be provided to the **County**:

1. Affidavit of compliance with the requirements of AWWA C502.

2. Records of standard tests.

D. Manufacture:

1. Fire hydrant shall be cast iron traffic, three-way 4½-inch valve, left opening type.

2. Internal main valve diameter shall be a minimum of 5¼ inches.

3. Each hydrant shall have the name of the manufacturer, the year of manufacture and the nominal size in legible, raised letters cast on the barrel or bonnet.

4. Each hydrant shall be constructed with a moist-proof lubricant chamber that encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. The bonnet shall have “O” ring packing and reservoir capable of utilizing oil or grease so that all operating parts are enclosed in the lubricant.

5. Operating nut shall be bronze, 7/8-inch tapered square nut with tamper-proof device. The direction “opening left” shall be marked on a special tamper-proof device. The tamper-proof device shall be a combination fold-down nut for the op-nut. Hydrant shall have ductile iron combination hold-down nut and operating nut shield to eliminate operation of hydrant with wrenches other than a special socket-type wrench. Arrow shall be cast on the outside of the periphery of the operating nut shield indicating direction of the operation for opening the hydrant.

6. The hydrant barrel section shall be connected at the ground line in a manner that will prevent damage to the hydrant when struck by a vehicle. The main valve rod section shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.

7. The hydrant main valve shall be made of synthetic rubber and formed to fit the valve seat accurately. The hydrant valve shall be made from material that will resist damage from rocks or other foreign matter. The valve shall be reversible. The hydrant shall be a true compression type, opening against pressure and closing with pressure.

8. The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement. Two “C” ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained to allow without the employment of torque of torque compressed gaskets.

The hydrant shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single, lightweight disassembly wrench without excavating.

9. The drain mechanism shall be designed to operate with the operation of the main valve and shall allow a momentary flushing of the drain ports. A minimum of two internal and two external bronze-lined drain pots shall be required in the main valve assembly to drain the hydrant barrel.

10. Cast iron inlet elbows shall have a 6-inch mechanical joint connection complete with accessories.

11. Barrel extension sections shall be available in 6-inch increments complete with rod, extension, coupling, and the necessary flanges, gaskets, and bolts, so that extending the hydrant can be accomplished without excavating. Hydrants shall have letters “AWB” cast in the barrel for identification purposes. Bury mark of fire hydrant shall be cast on barrel of the hydrant.

12. Hydrant shall have two 2½-inch hose nozzles 120 degrees apart and one 4½-inch pumper nozzle. The threads shall be national standard threads. The nozzle caps shall be secured to fire hydrant with non-kinking type chain loop on cap ends to permit free turning of caps.

13. Bolts and nuts shall be corrosion resistant.

14. Hydrants shall be designed with safety flange to protect the barrel and stem from damage and to eliminate flooding of area when hydrant is struck or knocked off by vehicular equipment or other objects.

E. Setting Hydrants:

1. Hydrants shall be placed at the locations indicated on the Plans in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians will be minimized. The contractor shall install proper “bury” hydrants or shall use, at no cost to the County, proper length extensions to ensure that each fire hydrant is installed in accordance with the manufacturer’s recommendation and the requirements of these Specifications. When placed behind curb, the hydrant barrel shall be set such that no portion of the pumper or hose nozzle caps will be less than 6 inches, nor more than 12 inches from the gutter face of the curb. The contractor shall place gravel as shown on the Plans. All pipe connecting the fire hydrant to the main line shall be ductile iron pipe meeting the requirements of these Specifications or approved connecting pieces.

2. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main shall be through either a ductile iron tee or a tapping sleeve and shall include an outlet valve at the

point of connection. Using a tapping sleeve where the Plans indicate a tee shall not result in any additional costs to the **County**.

F. Connection to main: Each fire hydrant shall be connected to the main with a six (6) inch ductile iron branch connection. Gate valves shall be used on fire hydrant branches unless otherwise specified.

G. Drainage: Stone no larger than 4 inches in diameter, shall be placed around the base of the fire hydrant for a depth of 30 inches from the bottom of the trench and shall extend for a distance of 30 inches from the back of the hydrant toward the main.

H. Anchoring and Bracing: The shoe of each fire hydrant shall be braced against unexcavated earth at the end of the trench with stone slabs or poured concrete; or it shall be tied to the pipe with suitable metal tie rods or clamps or both, as directed by the **County**. The straps and rods, nuts and threads, used for anchoring shall be coated with protective materials at the end of installation.

I. Painting, Coating, and Lubricating:

1. All iron parts of the hydrant inside and outside shall be cleaned and thereafter, unless otherwise stipulated, all surfaces, except the exterior portion above the ground line, shall be coated or painted with, or dipped in an asphalt or bituminous base paint or coating. If these parts are painted, they shall be covered with two coats, the first being allowed to dry thoroughly before the second coat is applied.

2. The outside of the hydrant valve above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two coats of Koppers primer 621or approved equal. After installation, each hydrant shall be painted with two field coats of Glamortex Enamel as manufactured by the Inertol Company or approved equal, color shall be silver. The top cap of each hydrant shall be painted in one of the following colors to indicate the main size: 6-inch or 8-inch mains shall be silver; 10-inch or 12-inch mains shall be yellow; and 16-inch or greater mains shall be green.

3. All bronze, threaded contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rustproof compound to prevent damage in shipment and storage.

J. Accessories: The Contractor shall furnish one standard four-sided hydrant wrench for each ten hydrants installed or fraction thereof.

K. Testing: All fire hydrants shall be tested in strict accordance with the requirements of AWWA C502, with no additional cost to the **County**. A Certificate of Compliance shall be furnished to the **County**.

2.08 GATE VALVES (GV)

A. Twenty Inches in Diameter and Smaller:

1. Gate valves shall be resilient-seated type conforming to the requirements of AWWA C509 or AWWA C515.

2. Valves through 12 inches in diameter shall have a minimum rated working pressure of 200 psi. Sixteen-inch and 20-inch valves shall have a minimum rated working pressure of 150 psi.

3. Valves less than 4 inches in diameter shall have threaded ends. Larger valves shall be mechanical joint unless shown otherwise on the Plans.

4. Valves shall be non-rising stem type with a two 2-inch-square wrench nut, and shall open left. The manufacturer shall provide an affidavit of compliance with the applicable AWWA standards.

5. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to the requirements of AWWA C550.

6. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.

7. Valve disks shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating.

8. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.

B. Twenty-four Inches in Diameter and Larger:

1. Valves shall be double disc type conforming to the requirements of AWWA C500.

2. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type operator. Valves shall be rated for 150-psi working pressure.

3. Valve ends shall be mechanical joint type except where restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

4. Buried valves shall be equipped with valve boxes unless access to the operator is provided by a manhole.

5. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.

6. Gate valves 24 inches in diameter and larger shall be manufactured by American R/D Gate Valve Company, Mueller, M & H Valve or equal.

2.09 BUTTERFLY VALVES (BV)

A. Unless indicated on the Plans to be 250-pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504 for Class 150B.

B. Where butterfly valves are indicated on the Plans to be 250-pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504, and as modified below. Valves shall be designed for a rated working pressure of 250 psi. Class B, AWWA C504 Section 5.2 testing requirements are modified as follows:

1. The leakage test shall be performed at a pressure of 250 psi.
2. The hydrostatic test shall be performed at a pressure of 500 psi.
3. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the **County**.

C. 150-Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65 45 12 or ASTM A126, Grade B cast iron. Shafts shall be ASTM A76, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65 45 12 or ASTM A126, Grade B cast iron. The valve shall have a resilient seat.

D. 250-Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65 45 12 or ASTM A126, Grade B cast iron. Shafts and shaft hardware shall be ASTM A564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65 45 12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.

E. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

F. Actuators:

1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured, and tested in accordance with the requirements of AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.

2. Actuators shall be furnished with fully adjustable mechanical stop limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.

3. Valve actuators shall be capable of withstanding a minimum of 450-foot-pounds of input torque in either the open or closed position without damage.

G. Operators: Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension, as required.

H. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown on the Plans. Flange joints shall meet the requirements of ANSI B16.1, Class 125.

I. Butterfly valves shall be manufactured by Mueller (Pratt), DeZurik, or equal.

2.10 VALVE BOXES (VB) AND EXTENSION STEMS

A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5¼-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6 inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.

B. All valves shall be furnished with extension stems if operating nut is greater than 4 feet deep, to bring the operating nut to within 24 inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A-26441 or M & H Valve Style 3801 or equal.

2.11 VALVE MARKERS (VM)

A. The **Contractor** shall provide a concrete valve marker as detailed on the Plans for each valve installed, except on hydrant isolation valves. Valve markers shall be stamped “WATER.”

2.12 TAPPING SLEEVES AND VALVES (TS&V)

A. Tapping sleeves for mains 12 inches in diameter and smaller shall be ductile iron of the split sleeve, mechanical joint type. Tapping sleeves shall be equal to Mueller H-615.

B. Tapping sleeves for mains larger than 12 inches shall be of all stainless steel construction.

C. The **Contractor** shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. The tapping sleeve shall be rated for 250 psi.

D. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer.

2.13 CORPORATION COCKS AND CURB STOPS

A. Corporation cocks and curb stops shall be ball type, shall be made of bronze conforming to the requirements of ASTM B61 or ASTM B62, and shall be suitable for the working pressure of the system. Ends shall be suitable for flared tube joint. Threaded ends for inlet and outlet of corporation cocks shall conform to the requirements of AWWA C800; coupling nut for connection to flared copper tubing shall conform to the requirements of ANSI B16.26. Corporation cocks and curb stops shall be manufactured by Mueller, Ford FB-600, or equal.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES AND OBSTRUCTIONS

A. The Plans indicate utilities or obstructions that are known to exist according to the best information available. The **Contractor** shall call the Utilities Protection Center (UPC) (800 282-7411) as required by Georgia Law (O.C.G.A. Sections 25 9 1 through 25 9 13), and shall call all utilities, agencies, or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours, or 3 business days, prior to construction to verify the location of the existing utilities.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service:

1. The **Contractor** shall provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The **Contractor** shall ensure at the time of any excavation that a valid utility location exists at the point of excavation.

2. The **Contractor** shall expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. The **Contractor** shall repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.

3. The **Contractor** shall avoid utility damage and interruption by protection with means or methods recommended by the utility owner.

4. The **Contractor** shall maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The **Contractor** shall provide the **County** with an updated copy of the log biweekly, or more frequently if required by the **County**.

C. Conflict with Existing Utilities:

1. Horizontal Conflict: Horizontal conflict shall be defined as that condition when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying back, supporting, or temporarily suspending service of the parallel or crossing facility. The **Contractor** may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right of way or easement, complies with regulatory agency requirements, and submits a written request to and subsequently receives approval from the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The **Contractor** shall receive approval from the **County** for any utility relocation.
2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The minimum clearance shall be 12 inches. The **Contractor** may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The **Contractor** shall receive approval from the **County** for any utility relocation.

D. Electronic Locator: The **Contractor** shall have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Sewer Line Separation:

1. Water mains should maintain a minimum 10-foot edge to edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right of way and provide the 10-foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18 inches above the top of the sewer.

Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18 inches.

2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.02 CONSTRUCTION ALONG HIGHWAYS, STREETS, AND ROADWAYS

A. The **Contractor** shall install pipe lines and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation or applicable permitting authority and the **County** with reference to construction operations, safety, traffic control, road maintenance, and repair.

B. Traffic Control: Shall meet the requirements of Section 01550 and as stipulated below.

1. The **Contractor** shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the Work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved training program.

2. Construction traffic control devices and their installation shall be in accordance with the current Manual on Uniform Traffic Control Devices for Streets and Highways.

3. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation and the County a minimum of 48 hours in advance of the activity.

4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right of way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as “Flagmen Ahead,” shall be removed and replaced when needed.

5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary

relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.

7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the Georgia Department of Transportation and the **County**. Sign panels shall be of durable materials capable of maintaining their color, reflective character, and legibility during the period of construction.

8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the Manual on Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to ensure that they are maintained in the proper position throughout their period of use.

C. Construction Operations:

1. The **Contractor** shall perform all work along highways, streets, and roadways to minimize interference with traffic.

2. Stripping: Where the pipeline is laid along road right of way, the **Contractor** shall strip and stockpile all sod, topsoil, and other material suitable for right of way restoration.

3. Trenching, Laying and Backfilling: The **Contractor** shall not open the trench any further ahead of pipe laying operations than is necessary. The **Contractor** shall backfill and remove excess material immediately behind laying operations. The **Contractor** shall complete excavation and backfill for any portion of the trench in the same day.

4. Shaping: The **Contractor** shall reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. The **Contractor** shall replace topsoil, sod, and any other materials removed from shoulders.

5. Construction operations shall be limited to 400 feet along areas, including cleanup and utility exploration.

D. Excavated Materials: The **Contractor** shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. The **Contractor** shall sweep all scattered excavated material off the pavement in a timely manner, meeting all E&S codes.

E. Drainage Structures: The **Contractor** shall keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff. E&S measures shall be maintained and the contractor is subject to clean any storm line and MH that has received siltation.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right of way and easement. The **Contractor** shall take extreme care in moving landscape features and promptly reestablish these features.

G. Maintaining Highways, Streets, Roadways, and Driveways:

1. The **Contractor** shall maintain streets, highways, roadways, and driveways in suitable condition for movement of traffic until completion and final acceptance of the Work.

2. During the time period between pavement removal and completing permanent pavement replacement, the **Contractor** shall maintain highways, streets, and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.

3. The Contractor shall furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.

4. The **Contractor** shall immediately repair all driveways that are cut or damaged and the **Contractor** shall maintain them in a suitable condition for use until completion and final acceptance of the Work.

3.03 PIPE DISTRIBUTION

A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.

B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the **Contractor** is actually working without written permission from the **County**. The **County** reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The **Contractor** shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets, and roadways upon which pipe is distributed.

D. No distributed pipe shall be placed inside drainage ditches.

E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than 5 feet from the roadway pavement, as measured edge to edge.

3.04 LAYING AND JOINTING PIPE AND ACCESSORIES

A. The **Contractor** shall lay all pipe and fittings to accurately conform to the lines and grades established by the **County**.

B. Pipe Installation:

1. Pipe shall be installed in accordance with the requirements of AWWA M11, chapter 16. Welded joints shall be in accordance with the requirements of AWWA C206.

2. Sleeve-type mechanical pipe couplings shall conform to the requirements of AWWA M11.

3. Unless otherwise specified, buried mechanical couplings and valves shall be field coated as shown on the Plans, specified in these Specifications, or as directed by the **County**.

4. Anchorage shall be provided as shown on the Plans, specified in these Specifications, or as directed by the **County**.

5. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of slings, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

6. All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be rejected by the **County** and replaced at the **Contractor's** or manufacturer's expense.

7. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit

or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.

8. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time.

9. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

10. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.

11. The Contractor shall not apply pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade.

12. The **Contractor** shall provide detection tape for all pipe greater than 12 inches in diameter. Detection tape shall be buried 4 to 10 inches deep. Should detection tape need to be installed deeper, the **Contractor** shall provide 3-inch-wide tape. In no case shall detection tape be buried greater than 20 inches from the finish grade surface.

C. Alignment and Gradient:

1. The **Contractor** shall lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. The **Contractor** shall not deflect any joint more than the maximum deflection recommended by the manufacturer.

2. The **Contractor** shall maintain a transit, level, and accessories on the site of the Work to lay out angles and ensure that deflection allowances are not exceeded.

D. Expediting of Work: The **Contractor** shall excavate, lay the pipe, and backfill as closely together as possible. The Contractor shall not leave un-jointed pipe in the trench overnight. The **Contractor** shall backfill and compact the trench as soon as possible after laying and jointing is completed. The **Contractor** shall backfill the installed pipe each day at the close of work and at all other times when work is not in progress. No excavation is to be left unbackfilled or unsupervised. If necessary to backfill over the end of an uncompleted pipe or accessory, the **Contractor** shall close the end with a suitable plug, either push-on, mechanical joint, restrained joint, or as approved by the **County**.

E. Joint Assembly:

1. Push-on, mechanical, flange, and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.

2. The **Contractor** shall inspect each pipe joint within 1,000 feet on either side of main line valves to ensure 100 percent seating of the pipe spigot, except as noted otherwise.

3. Each restrained joint shall be inspected by the **Contractor** to ensure that it has been “homed” 100 percent.

4. The **Contractor** shall internally inspect each pipe joint to ensure proper assembly for pipe 24 inches in diameter and larger after the pipe has been brought to final alignment.

F. Cutting Pipe: The **Contractor** shall cut ductile iron pipe using an abrasive wheel saw. The **Contractor** shall cut PVC pipe using a suitable saw, remove all burrs, and smooth the end before jointing. The **Contractor** shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories, and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

G. Polyethylene Encasement: Installation shall be in accordance with the requirements of AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the **County**.

H. Valve and Fitting Installation:

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage, and cracks. Defective valves shall be rejected by the **County** and replaced at the **Contractor’s** or manufacturer’s expense. Valves shall be closed before being installed.

2. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified in this section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as crushed stone, concrete pads, or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.

3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut, and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the **County**.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

5. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Plans or directed by the **County**, valve markers shall be installed 6 inches inside the right of way or easement, and buried to a depth of 30 inches as per Standard Detail No. **(Insert Detail No.).**

I. Air Valve Vaults:

1. The **Contractor** shall construct the vault or manhole as detailed on the Plans.

2. The frame and cover shall be cast into the top slab. The floor drain shall be piped to vault exterior.

3. Manholes shall be constructed such that their walls are plumb.

3.05 CONNECTIONS TO EXISTING WATER MAINS

A. The **Contractor** shall make connections to existing pipelines with tapping sleeves and valves, unless specifically shown otherwise on the Plans. Before connecting to any existing water main, the **Contractor** shall receive approval from the **County**.

B. Location: Before laying pipe, the **Contractor** shall locate the points of connection to existing water mains and uncover as necessary for the **County** to confirm the nature of the connection to be made.

C. Interruption of Services: The **Contractor** shall make connections to existing water mains only when system operations permit and only when notices are issued to the customer. The **Contractor** shall operate existing valves only with the specific authorization and direct supervision of the **County**.

D. Tapping Sleeves:

1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.

2. Prior to attaching sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.

3. Before performing field machine cut, the water tightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure as specified in this section. No leakage shall be permitted for a period of 5 minutes.

4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a 1-percent sodium hypochlorite solution.

E. Connections Using Solid Sleeves: Where connections are shown on the Plans using solid sleeves, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipeline.

F. Connections Using Couplings: Where connections are shown on the Plans using couplings, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging, and backfill.

G. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line, or the existing private service line, shall be provided by the **Contractor**. To minimize out of service time, the contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

3.06 THRUST RESTRAINT

A. The **Contractor** shall provide restraint at all points where hydraulic thrust may develop.

B. Retainer Glands: The Contractor shall provide retainer glands where shown on the Plans. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The **Contractor** shall furnish a torque wrench to verify the torque on all set screws that do not have inherent torque indicators.

C. Harnessing:

1. The **Contractor** shall provide harness rods only where specifically shown on the Plans or directed by the **County**.

2. Harness rods shall be manufactured in accordance with the requirements of ASTM A36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot-dip galvanized or field-coated with bitumastic before backfilling.

3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, the **Contractor** shall provide 90-degree bend eye bolts.

4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.

D. Thrust Collars: Collars shall be constructed as shown on the Plans. Concrete and reinforcing steel shall meet the requirements of Sections 03200 - Concrete Reinforcement and Section 03300 - Cast-In-Place Concrete. Welded on collar shall be designed to meet the minimum allowable load shown on the Plans. The welded-on collar shall be attached to the pipe by the pipe manufacturer.

E. Concrete Blocking as required and approved by the **County**:

1. The **Contractor** shall provide concrete blocking for all bends, tees, valves, and other points where thrust may develop in addition to thrust restraint as per Standard Detail No. **(Insert No.).**

2. Concrete shall be as specified in Section 03300 - Cast-In-Place Concrete.

3. The **Contractor** shall form and pour concrete blocking at fittings as shown on the Standard Details and as directed by the **County**. The **Contractor** shall pour blocking against undisturbed earth. The **Contractor** shall increase dimensions when required by over-excavation.

3.07 INSPECTION AND TESTING

A. All sections of the water main subject to internal pressure shall be pressure tested in accordance with the requirements of AWWA C600 and these Specifications. A section of main will be considered ready for testing after completion and curing of all thrust restraint and backfilling.

B. Water used for testing mains and washing streets will be made available to the **Contractor** at the nearest existing facilities of the Department of Watershed Management. The **Contractor** shall furnish all necessary pipe or hose extensions and transportation to the point of use and exercise care in use of the water. Water used for other purposes will be supplied through a metered connection, which the **Contractor** shall obtain through the Department of Watershed Management Applications Office.

C. Each segment of water main between main valves shall be tested individually.

D. Test Preparation:

1. For water mains less than 24 inches in diameter, the **Contractor** shall flush sections thoroughly at flow velocities, greater than 2½ feet per second, adequate to remove debris from pipe and valve seats. For water mains 24 inches in diameter and larger, the main shall be carefully swept

clean and mopped if directed by the **County**. The **Contractor** shall partially open valves to allow the water to flush the valve seat.

2. The **Contractor** shall partially operate valves and hydrants to clean out seats.

3. The **Contractor** shall provide temporary blocking, bulkheads, flanges, and plugs as necessary, to ensure all new pipe, valves, and appurtenances will be pressure tested.

4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. The **Contractor** shall insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as shown on the Standard Details with a meter box.

5. The **Contractor** shall fill the pipeline slowly with water. The **Contractor** shall provide a suitable pump with an accurate water meter to pump the line to the specified pressure.

6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure of the system. Where necessary, the **Contractor** shall provide temporary backpressure to meet the differential pressure restrictions.

7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.

E. Test Pressure: The **Contractor** shall test the pipeline at 250 psi measured at the lowest point for at least 2 hours. The **Contractor** shall maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. The **Contractor** shall provide an accurate pressure gage with graduation not greater than 5 psi.

F. Leakage:

1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

2. The **County** assumes no responsibility for leakage occurring through existing valves.

G. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD\,(P)1/2}{133{,}200}$$

Where: L = Allowable leakage, in gallons per hour.
S = Length of pipe tested, in feet
D = Nominal diameter of the pipe, in inches.
P = Average test pressure during the leakage test, in pounds per square inch (gauge).

As determined under Section 4 of AWWA C600.

H. If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results at the **Contractor's** expense.

I. Completion: After a pipeline section has been accepted, the **Contractor** shall relieve test pressure. The **Contractor** shall record type, size, and location of all outlets on the Record Drawings.

3.08 DISINFECTING PIPELINE

A. After successfully pressure testing each pipeline section, the **Contractor** shall disinfect in accordance with the requirements of AWWA C651 for the continuous feed method and these Specifications.

B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the **Contractor** shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water. The **Contractor** shall receive approval from the County where to dispose of chlorinated water.

C. Chlorination:

1. The **Contractor** shall apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in the new line. The **Contractor** shall retain chlorinated water for 24 hours. Water shall be supplied from a temporary source protected by appropriate backflow prevention devices. The backflow preventer shall be approved by the **County** prior to connection. Chlorine shall be injected no more than 10 feet from the beginning of the new main.

2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24-hour period.

3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. The **Contractor** shall rechlorinate if the required results are not obtained on all samples.

D. Disposal of Chlorinated Water: The **Contractor** shall reduce the chlorine residual of disinfection water to less than 1 milligram per liter if discharged directly to a body of water or to less than 2 milligrams per liter if discharged onto the ground prior to disposal. The **Contractor** shall treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. The **Contractor** shall flush all lines until the residual is equal to existing system.

E. Bacteriological Testing: After final flushing and before the water main is placed in service, the **Contractor** shall collect samples from the line and have them tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. The **County** reserves the right to collect and test the samples in the **County's** laboratory One set of samples shall be collected from every 1,200 feet of water main, plus one set from each end of main and one set from each branch. If the test results are not acceptable, the **Contractor** shall rechlorinate lines at its cost until the required results are obtained.

3.09 PROTECTION AND RESTORATION OF WORK AREA

A. General: The **Contractor** shall return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is completed. Restoration of streets, sidewalks, curb and driveways shall comply with Section 02700. Restoration of off-street areas shall comply with the requirements of Section 02920 and as stipulated below.

1. The **Contractor** shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.

2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.

4. The **County** shall be authorized to stop all work by the **Contractor** when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.

B. Man Made Improvements: The **Contractor** shall protect or remove and replace, with the **County's** approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins, and other improvements that may be encountered in the Work.

C. Cultivated Growth: The **Contractor** shall not disturb cultivated trees or shrubbery unless approved by the **County**. Any such trees or shrubbery that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

D. Cutting of Trees: The **Contractor** shall not cut trees for the performance of the Work except as absolutely necessary and with the approval from the **County**. The **Contractor** shall protect trees that remain in the vicinity of the work from damage from equipment. The **Contractor** shall not store spoil from excavation against the trunks. The **Contractor** shall remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. The **Contractor** shall repair any damaged tree over 3 inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the site of the Work and disposed of by the **Contractor** in a lawful manner. No stumps, wood piles, or trash piles will be permitted on the site of the Work.

E. Disposal of Rubbish: The **Contractor** shall dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate Federal, State, and local regulatory agencies.

F. Wetlands:

1. The **Contractor** shall not construct permanent roadbeds, berms, drainage structures, or any other structures that alter the original topographic features within the easement.

2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the **Contractor**.

3. The **Contractor** shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland, or stream that may be temporarily divided by construction.

4. The **Contractor** shall not spread, discharge, or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

3.10 ABANDONING EXISTING WATER MAINS

A. General: The **Contractor** shall abandon in place all existing water main segments indicated on the Plans to be abandoned. The **Contractor** shall perform abandonment after the new water main has been placed in service and all water main services have been changed over to the new main. The **Contractor** shall salvage for the **County** existing fire hydrants, valve boxes, valve markers, and other materials located on water mains abandoned.

B. Capping and Plugging: The **Contractor** shall disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is directed by the **County**. The **Contractor** shall provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. The **Contractor** shall seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum 6-inch cover of concrete on all sides around the end of the pipe. The **Contractor** shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged. The abandoned pipeline shall be filled with flowable fill if directed by the **County**.

C. Salvaging Materials: The **Contractor** shall salvage existing fire hydrants, valve boxes, valve markers, and other materials located of water mains abandoned and deliver salvaged items in good condition to the **County's** storage yard. The **Contractor** shall coordinate delivery and placement of salvaged materials in advance with the **County**.

D. Pavement Removal and Replacement: The **Contractor** shall perform any necessary pavement removal and replacement in accordance with Standard Detail No. W-43 and Section 02700 - Pavement Repairs.

+++ END OF SECTION 02665 +++

SECTION 02665T
WATER TRANSMISSION MAINS AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. The work included under this section includes providing all labor, materials, equipment, tools, and incidentals required for a complete installation of water transmission mains and accessories as shown on the Plans and as specified in this section.

B. The **Contractor** shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), Steel Structures Painting Council (SSPC), and other recognized standards. Latest revisions of all standards are applicable.

C. Water transmission mains, valves, hydrants, and appurtenances shall be installed before the installation of the sub-base course or paving or any other utilities.

D. Related Work Specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 01550 - Traffic Regulation
3. Section 02200 - Site Preparation
4. Section 02205 - Dewatering
5. Section 02315 - Excavation and Backfill for Structures
6. Section 02324 - Trenching and Trench Backfilling
7. Section 02700 - Pavement Repairs
8. Section 02710 - Concrete Curbs and Sidewalks
9. Section 02920 - Site Restoration

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. Complete product data and engineering data, including shop drawings.

2. Documentation that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least 10 years.

3. Written certification to the **County** that all products furnished comply with all applicable requirements of these Specifications.

1.03 QUALITY ASSURANCE

A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. ANSI A21.4 (AWWA C104) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids.
2. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings.
5. AWWA C104 (ANSI A21.4) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids.
6. AWWA C110 (ANSI A21.10) - Ductile Iron and Gray Iron Fittings, 3-in. through 48-in., for Water and Other Liquids.
7. AWWA C111 (ANSI A21.11) - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
8. AWWA C150 (ANSI A21.50) - Thickness Design of Ductile Iron Pipe.
9. AWWA C151 (ANSI A21.51) - Ductile Iron Pipe, Centrifugally Cast for Water and Other Liquids.
10. AWWA C153 (ANSI A21.53) - Ductile Iron Compact Fittings, 3-in. through 24-in. and 54-in. through 64-in., for Water Service.
11. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.
12. AWWA C606 - Joints, Grooved and Shouldered Type.
13. AWWA C651 - Disinfecting Water Mains.
14. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning.
15. Other ANSI, ASTM and AWWA specifications referenced herein.

1.04 TRANSPORTATION AND HANDLING

A. Unloading: The **Contractor** shall furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves, and accessories. The **Contractor** shall make equipment available at all times for use in unloading. The **Contractor** shall not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.

B. Handling: The **Contractor** shall handle pipe, fittings, valves, and accessories carefully to prevent shock or damage. The **Contractor** shall handle pipe by rolling on skids, forklift, or front-end loader. The **Contractor** shall not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.05 STORAGE AND PROTECTION

A. The **Contractor** shall store all pipe that cannot be distributed along the route. The **Contractor** shall make arrangements for the use of suitable storage areas.

B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

D. Stored mechanical and push-on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.06 WATER MAIN LOCATION

A. The minimum depth of cover shall be 4 feet and the maximum cover shall be 5 feet. Any deviations shall be specifically approved by the **County**.

B. The installation of a water main parallel to another utility in the same vertical plane is not permitted. That is, “stacking” of utilities is not permitted.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE

A. Ductile iron pipe shall be manufactured in accordance with the requirements of AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes shall be as shown on the Plans. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise shown on the Plans or specified in these Specifications or approved by the **County**

Pipe Sizes (inches)	**Pressure Class (psi)**
4 – 12	350
14 – 18	350
20	300
24	250
30 – 54	200
60 – 64	200

B. Ductile Iron Pipe and fittings shall be cement lined in accordance with the requirements of AWWA C104. A seal coat over the cement lining is not required. Pipe and fittings shall be furnished with a bituminous outside coating.

C. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.

D. Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47, ASTM A197, or ANSI B16.3

E. Unless otherwise specified, steel fittings and appurtenances shall conform to the requirements of ASTM A234, ASTM A105, or ANSI B16.11; and fabricated steel fittings and appurtenances shall conform to the requirements of AWWA C208.

F. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to the requirements of ASTM A536 or malleable iron conforming to the requirements of ASTM A47. Standard steel fittings, including large size elbows, shall be forged steel conforming to the requirements of ASTM A106. Standard segmentally welded fittings shall be fabricated of Schedule 40 carbon steel pipe.

G. Joints:

1. Unless shown or specified otherwise, joints for ductile iron pipe shall be push-on or restrained joint type for pipe and standard mechanical, push-on, or restrained joints for fittings. Push-on and mechanical joints shall conform to the requirements of AWWA C111.

2. The only acceptable restrained joint systems for ductile iron pipe are identified in the Table 1. unless approved by the **County.** No field welding of restrained joint pipe will be allowed.

Table 1 - **Acceptable Restrained Joints**

Size	**ACIPCO**	**U.S. Pipe**	**McWane**	**Generic**[(1)]
4 – 12	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 – 24	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 – 36	Flex Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 – 48	Lok-Ring	TR Flex	N/A	MJ with Retainer Gland
54 – 64	Lok-Ring	TR Flex	N/A	N/A

(1) Fittings and valves only, and only where specifically allowed.

3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet.

4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

H. The **Contractor** shall provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of ⅛ inch thick, cloth reinforced rubber; gaskets may be ring type or full-face type.

I. Bolts and Nuts:

1. The **Contractor** shall provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with the requirements of ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.

2. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with the requirements of ASTM A242 to the dimensions shown in AWWA C111/ANSI A21.11.

3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to the requirements of ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.

4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to the requirements of ASTM A307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to the requirements of ASTM B633, Type II.

5. Bolts for submerged service shall be stainless steel machine bolts conforming to the requirements of ASTM A193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to the requirements of ASTM A194, Grade 8.

J. Mechanical joint glands shall be ductile iron.

K. Welded Outlet: Welded outlets may be provided in lieu of tees or saddles on mains with a diameter greater than or equal to 24 inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 (Pressure Class 350 for 60- and 64-inch sizes). The welded outlet shall be rated for 250 psi working pressure. Each welded outlet shall be hydrostatically tested at 500 psi. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in the Table 2:

Table 2

Parent Pipe Diameter, Inches	**Maximum Outlet Diameter, Inches**
24	16
30	20
36	24
42	30
48	30
54	30
60	30
64	30

L. Ductile iron pipe shall be encased with polyethylene film where shown on the Plans. Polyethylene film shall be in accordance with the requirements of AWWA C105.

M. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.

N. Acceptance shall be on the basis of the **County**'s inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

O. Pipe Lining

1. Cement Mortar**:** Unless otherwise specified, pipe and fittings shall be lined with cement mortar as specified in AWWA C205. Fittings and specials larger than 24 inches not fabricated from centrifugally lined straight sections, shall require 2 inches by 4 inches by 13-gage self-furring wire mesh reinforcement for hand-applied lining**.**

P. Pipe Coating

1**.** Epoxy: Unless otherwise specified, pipe and fittings shall be coated with a liquid epoxy as specified in AWWA C210 with the following requirements:

a. No Coal tar products shall be incorporated in the liquid epoxy.

b. The curing agent may an amidoamine as well as other curing agents listed in AWWA C210

c. The coating shall be applied to a minimum thickness of 16 mils in not less than two coats.

d. Polyethylene tape**:** Where shown on the Plans or directed by the **County**, pipe and fittings shall be coated and wrapped with prefabricated multi-layer cold applied polyethylene tape coating in accordance with the requirements of AWWA C214. The coating application shall be a continuous step operation in conformity with the requirements of AWWA C214, Section 3. The total coating thickness shall be not less than 50 mils for pipe 24 inches and smaller and not less than 80 mils for pipe 26 inches and larger.

Q. Piping Appurtenances

1. Retainer Glands:

a. Retainer glands shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400 or equal, as manufactured by Ford Meter Box Company.

b. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants and other locations as shown on the Plans.

R. Hydrant Tees: Hydrant tees shall be equal to ACIPCO A10180 or U.S. Pipe U-592.

S. Anchor Couplings: Lengths and sizes shall be as shown on the Plans. Anchor couplings shall be equal to ACIPCO A 10895 or U.S. Pipe U-591.

T. Hydrant Connector Pipe: The connector pipe shall be ductile iron meeting the requirements of AWWA C153; 24-inch offset design so that the hydrant can be adjusted to ensure placement at the proper grade; shall have an anchoring feature at both ends so that when used with M.J. split glands a restrained joint is provided; cement lined in accordance with AWWA C104 and equal to the Gradelok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.

U. Tapping Saddles: Tapping saddles are not allowed unless approved by the **County.**

V. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, “Caution Water Line Buried Below”. Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2 inches when buried less than 10 inches below the surface. Tape width shall be a minimum of 3 inches when buried greater than 10 inches and less than 20 inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

2.02 WELDED STEEL PIPE

A. Conform to AWWA C200 and AWWA C208, except where modified and supplemented by these Specifications.

B. COATING

1. Exterior: System No. 8, Buried Metal—General, as specified in Section 09900, PAINTING. The plain ends of the pipe shall be coated with System No. 1 as specified in this section and Section 09900, PAINTING. System No. 1 coating shall extend a minimum of 4 inches and a maximum of 6 inches from the pipe end.

2. Interior: System No. 1, Submerged Metal—Potable Water, as specified in Section 09900, PAINTING.

C. Pipe furnished in accordance with AWWA C200, Section 2.1, shall be fabricated from ASTM A570, Grade 40 steel, or equal.

D. Diameter and Wall Thickness

1. The pipe and fittings shall be furnished to the nominal diameters shown on the Drawings and in accordance with AWWA M11. The pipe and fittings shall have the minimum wall thicknesses shown in Table 3.

Table 3	
Nominal Diameter (Inches)	**Wall Thickness (Inches)**
24 and Smaller	¼
26 through 36	3/8
38 through 60	½

E. Joints

1. Joints shall be in accordance with AWWA C200 and AWWA M11. Joints shall be plain end, butt welded, or flanged, as shown on the Drawings.
2. Plain End: Join using flexible couplings and thrust tie rods.
3. Welded Joints:
    a. All welded joints and materials shall be in conformance with AWWA C206. Submit detailed design of any proposed welded joints to the COUNTY for review and approval prior to field installation.
    4. The coatings of pipe and fittings to be field-welded shall have a holdback of a minimum of 4 inches and a maximum of 6 inches on each side of the field welds.

G. Flanges:
1. Flanges, where required, shall be steel hub flanges, conforming to AWWA C207, Class E. All flanges shall be faced and drilled to ANSI B16.1, Class 125. Bolt holes for insulating flanges will require oversizing for insulating sleeves.
2. All nuts, bolts, and gaskets required for joining the flanged pipe, fittings, and appurtenances shall meet the requirements of AWWA C207 and ANSI B16.1. Gaskets shall be cloth-inserted rubber, 1/8-inch thick, in one piece, full-cut with holes to pass the bolts. Segmented, straight joint or interlocking gaskets shall not be accepted.

H. Fittings
1. Fittings shall be fabricated in accordance with the details shown on the Drawings and shall be fabricated of a minimum of the same gauge material as that of the adjacent straight pipe section and in accordance with applicable parts of AWWA C200. Reinforcement fittings is required. Some reinforcement is shown on the Drawings. Reinforcement of fittings shall be designed and located in accordance with AWWA M11. Weldolets shall be provided for taps, where required. Where dimensions of specials and fittings are not shown, they shall be in conformance with AWWA C208.
2. Thrust tie lugs shall be welded to pipe by manufacturer prior to the application of the protective coatings.

I. Hydrostatic Test of Pipe and Fittings: Fabricated pipe and fittings shall be subjected to a 250-psig hydrostatic test pressure by the manufacturer. Testing procedures shall be in accordance with AWWA C200.

J. Feeler Gauge
1. Furnish sufficient feeler gauges for use throughout the complete project.

K. Flexible Couplings

1. Flexible couplings shall be wrought steel capable of withstanding the designated internal pressure without leakage or overstressing. Middle ring shall include center stops where shown.
2. Steel flexible couplings shall be as manufactured by Rockwell International, Inc.; Dresser Manufacturing Division of Dresser Industries, Inc.; or approved equal. All couplings shall have stainless steel bolts and nuts of adequate strength for the service and shall be fully restrained. All couplings shall be coated with System No. 29, Fusion Bonded Coating, as specified in Section 09900, PAINTING. Flexible coupling shall be Rockwell No. 411 or Dresser No. 38.
3. Middle ring length shall be 7 inches for pipes through 30 inches in diameter and 10 inches for pipes larger than 30 inches in diameter. Gaskets shall be Buna-N or the equivalent as approved, except special gaskets shall be used in certain buried areas as shown on the Drawings. Special gasket material shall meet the requirements of AWWA C11 and be fluorocarbon elastomer rubber such as Viton or Fluorel.

L. Joint Harness

1. Joint harness shall be used where thrust ties are indicated and at all flexible couplings unless otherwise shown. The joint harness shall be of adequate strength to prevent movement of the joint with 250-psi internal pressure on the pipe. The harness design shall be as shown on the Drawings. Joint harness lugs shall be coated with System No. 8, Buried Metal - General, as specified in Section 09900, PAINTING. Tie rods and nuts shall be coated with System No. 29, Fusion Bonded Coating, as specified in Section 09900, PAINTING.

M. Concrete for Thrust Blocking or Pipe Encasement

1. Concrete for thrust blocking shall be in conformance with Section 03300 - Cast In Place Concrete.

N. Field Touchup Materials

1. Field touchup materials shall be furnished as necessary to make repairs to the coatings. Materials and methods shall conform to the manufacturer's recommendations.

O. Linings and Coatings

1. Cement-mortar Lining

   a. Interior surface of all steel pipe, fittings and specials shall be lined in the shop with cement-mortar lining applied centrifugally and conforming with AWWA C205.
   b. Holdbacks shall be left bare and be provided as shown on the approved shop drawings. Holdbacks shall be filled with cement mortar after joint completion per ASSW C205.

c. Defective linings as identified in AWWA C205 shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.

d. Fittings shall be cement-mortar lined per AWWA C205. Pipe and fittings too small to cement-mortar line may be lined with AWWA C210 epoxy or AWWA C222 polyurethane.

e. Cement-mortar lining shall be kept moist during storage and shipping. The **Contractor** shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

2. Polyethylene Tape Coating

a. The prefabricated multi-layer cold applied tape coating system for straight-line pipe shall be in accordance with AWWA C214. The system shall consist of a three-layer system totaling 80 mils.

b. An acceptable alternate is a two-layer extruded polyolefin coating system in accordance with AWWA C215.

3. Coating of Fittings, Specials and Joints

a. Fittings, specials and joints that cannot be machine coated, shall be coated in accordance with AWWA C209. Prefabricated tape shall be Type II and shall be compatible with the tape system used for straight-line pipe. The system shall consist of 2 layers totaling 70 mils.

b. Alternate coating methods for fittings, specials and field joints are shrink sleeves per AWWA C216, liquid epoxy per AWWA C210, or polyurethane per AWWA C222.

c. Joint bonds shall be completely encapsulated by the coating system as per manufacturer's recommendations.

d. Coating repair for fittings and specials shall be in accordance with the procedure described below for straight-line pipe.

4. Coating repair shall be made using tape and primer conforming to AWWA C209 Type II and manufacturer's recommendations. The tape and primer shall be compatible with the tape system used for straight-line pipe.

a. An alternative repair method shall be to install heat shrink sleeves in accordance with AWWA C216 and manufacturer's recommendations.

P. Fusion Epoxy Coating and Lining

1. Where shown on the Plans or directed by the **County**, steel pipe and fittings shall be fusion epoxy coated and lined. The fusion epoxy coating shall be 3M Scotchkote 203, or equal, approved by the **County**. Surface preparation shall be in accordance with the requirements of SSPC-SP 10 near white blast cleaning. The application method shall be by the fluidized bed method and shall attain 12 mils minimum dry film thickness.

2. Field welds, connections, and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 306.

2.02 Prestressed Concrete Cylinder Pipe and Fittings

A. Unless otherwise specified, the design materials and workmanship for pipe shall conform to the requirements of AWWA C301. Core and coating thickness for pipe shall be as specified in AWWA C301.

B. Design Conditions

1. Pipe shall be designed in accordance with the AWWA C304 Standard, using the following design conditions; these conditions shall also be used in designing fittings that include a Portland cement mortar interior and exterior coating of the steel cylinder:
2. External Loading

The earth load shall be taken as the greater of the following:
Depth from existing ground level to top of pipe as shown on plans, or
5 feet minimum in all cases.

Earth loads shall be computed assuming the trench width that gives the maximum load on the pipe (transition width) for the following parameters:

Unit Soil Weight = 120 pounds per cubic foot

TYPE R_5__ Bedding
Bedding angle = 150°
Live loads shall be calculated as:

Pipe in streets and other paved areas: AASHTO HS-20 for two tandem dump trucks maximum load passing

Pipe within railroad right-of-way: AREA Cooper E-80

Both HS-20 and E-80 live loads shall be computed in accordance with the *American Concrete Pipe Association* "Concrete Pipe Design Manual" or "Concrete Pipe Handbook."

Internal Pressure
Design working pressure (P_w) shall be 150 psi.
Surge Pressure (P_t) shall be 100 psi.
Field Test Pressure (P_{ft}) shall be 250 psi.

3. Fittings

Steel thickness of all fittings shall be designed in accordance with Chapter 8 of the AWWA M9 Manual. Fittings shall be designed for the same conditions as the adjacent pipe.

Fabrication of the fittings shall be as per AWWA M9 Manual and C301.

Interior and exterior concrete/mortar coating shall be as per AWWA C301.

The date of manufacture or a serial number traceable to the date of manufacture and the design strength classification shall be clearly marked by stencil with waterproof paint at the end of the pipe barrel. Unsatisfactory or damaged pipe will be permanently rejected, repaired in the field if permitted by the **County**, or returned for minor repairs. Pits, blisters, rough spots, minor concrete or mortar breakage, and other imperfections may be repaired unless prohibited by the **County**. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 3,000 psi at the end of 7 days and 4,500 psi at the end of 28 days, when tested in cylinders stored in the standard manner.

Major breakage or spalling from interior of pipe may be reason for the rejection of pipe. Pipe may be repaired under unloaded conditions (removal of prestressing wire). Cement mortar used for repair shall have a minimum compressive strength of 3,000 psi at 7 days and 4,500 psi at 28 days when tested as standard cylinders. New prestressing wire may be applied when the compressive strength as determined by cylinder testing equals or exceeds the strength required for prestressing as stated in AWWA C301.

Cement shall be Type II and shall be in accordance with ASTM C150.

The pipe core shall be manufactured by the centrifugal method or the vertical casting method.

Wire shall be a minimum of No.6 gauge and shall meet the requirements of ASTM A648, Class III. Wire of a class strength greater than Class III shall not be used.

Steel cylinders shall be No. 16 gauge minimum and shall be hot rolled.

Mortar coating shall consist of one part cement to a maximum of three parts fine aggregate by weight. Rebound not to exceed one fourth of the total mix weight may be used provided the rebound is treated as fine aggregate.

Bell and spigot joint rings shall be steel, self-centering type, and otherwise specified in AWWA C301. Surfaces of the joint rings that shall be exposed after fabrication is complete shall receive a zinc metalized coating of 4 mils thickness (0.004 inch). In areas of the alignment where the pipe will be subject to unbalanced hydrostatic thrust forces (bends, tees, bulkheads, wyes, and valves), the pipe joints shall be mechanically restrained (harnessed).

The maximum longitudinal stress in the steel cylinder of harnessed pipe sections shall not exceed 13,500 pounds per square inch when subjected to the internal working pressure or 17,000 pounds per square inch when subjected to the test pressure and shall be based on the deflection angle as described in the AWWA M9 Manual. The steel cylinder thickness in pipe sections between the location of the maximum thrust force and the end of the harnessed section can be prorated on the basis of zero longitudinal thrust at the end of the harnessed section.

Two acceptable types of harnessed or restrained joints are the harness clamp and Snap Ring® types of flexible restrained joints. The clamp type consists of two semicircular steel clamps that fit over steel lugs that are factory welded or rolled into the steel bell and spigot sections. The semicircular clamps are drawn together by bolts at the springline on both sides of the pipe to form a flexible restrained joint.

The Snap Ring® type of flexible restrained joint consists of a split steel ring that is recessed in the special steel bell section of the pipe until the joint is made. Once the joint is made, the split steel ring is drawn down into position to form a lock between the bell and spigot by tightening a single steel bolt.

Both joint types shall be capable of transmitting the longitudinal thrust forces due to working pressure and test pressure and shall be encased in grout after the joint has been completed and before the line is pressurized using special grout bands supplied by the pipe manufacturer.

Field welding of the joints for restraint during initial installation will not be allowed except where connecting to existing pipe or where follower ring closure assemblies are installed into restrained joint areas unless otherwise permitted by the **County**.

The rubber gaskets shall be in accordance with AWWA C301 and shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of the highest pressure to which the pipe will be subjected without showing any leakage by the gasket or displacement of it.

Bell and spigot wall fittings shall be manufacturer's standard design. Wall fittings shall be supplied with adequate bracing to keep them round and true during transportation and installation.

Alignment for long-radius, curved sections as specified on the drawings may be produced by joint deflections of standard joints not to exceed that recommended by the manufacturer. Deflections required that are in excess of those recommendations shall be produced by beveling the spigot ends of the pipe.

No work shall be performed on any PCCP without approval from the **County**.

2.06 FIRE HYDRANTS

A. General: Fire hydrant shall be a two-piece standpipe and stem, compression shutoff, dry-barrel type. Fire hydrant shall conform to the requirements of AWWA C502 and shall be listed by Underwriters Laboratories, Inc. in accordance with the requirements of UL 246.

B. Acceptable Products: Fire hydrants shall be American Valve and Hydrant B-62-B, M & H 129T, Mueller Super Centurion 250-AWB, A-423, Kennedy K81A, U.S. Metropolitan 250, or equal approved by the **County**.

C. Product Data: The following information shall be provided to the **County**:

1. Affidavit of compliance with the requirements of AWWA C502

2. Records of standard tests

D. Manufacture:

1. Fire hydrant shall be cast iron traffic, three-way 4½-inch valve, left opening type.

2. Internal main valve diameter shall be a minimum of 5¼ inches.

3. Each hydrant shall have the name of the manufacturer, the year of manufacture and the nominal size in legible, raised letters cast on the barrel or bonnet.

4. Each hydrant shall be constructed with a moist-proof lubricant chamber that encloses the operating threads and that provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. The bonnet shall have “O” ring packing and reservoir capable of utilizing oil or grease so that all operating parts are enclosed in the lubricant.

5. Operating nut shall be bronze, 7/8-inch tapered square nut with tamper-proof device. The direction “opening left” shall be marked on a special tamper-proof device. The tamper-proof device shall be a combination fold-down nut for the op-nut. Hydrant shall have ductile iron combination hold-down nut and operating nut shield to eliminate operation of hydrant with wrenches other than a special socket-type wrench. Arrow shall be cast on the outside of the periphery of the operating nut shield indicating direction of the operation for opening the hydrant.

6. The hydrant barrel section shall be connected at the ground line in a manner that will prevent damage to the hydrant when struck by a vehicle. The main valve rod section shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.

6. The hydrant main valve shall be made of synthetic rubber and formed to fit the valve seat accurately. The hydrant valve shall be made from material that will resist damage from rocks or other foreign matter. The valve shall be reversible. The hydrant shall be a true compression type, opening against pressure and closing with pressure.

7. The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze-to-bronze thread engagement. Two "C" ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained to allow without the employment of torque of torque compressed gaskets. The hydrant shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single, lightweight disassembly wrench without excavating.

8. The drain mechanism shall be designed to operate with the operation of the main valve and shall allow a momentary flushing of the drain ports. A minimum of two internal and two external bronze-lined drain pots shall be required in the main valve assembly to drain the hydrant barrel.

9. Cast iron inlet elbows shall have a 6-inch mechanical joint connection complete with accessories.

10. Barrel extension sections shall be available in 6-inch increments complete with rod, extension, coupling and the necessary flanges, gaskets and bolts, so that extending the hydrant can be accomplished without excavating. Hydrants shall have letters "AWB" cast in the barrel for identification purposes. Bury mark of fire hydrant shall be cast on barrel of the hydrant.

11. Hydrant shall have two 2½-inch hose nozzles 120 degrees apart and one 4½-inch pumper nozzle. The threads shall be national standard threads. The nozzle caps shall be secured to fire hydrant with non-kinking type chain loop on cap ends to permit free turning of caps.

12. Bolts and nuts shall be corrosion resistant.

13. Hydrants shall be designed with safety flange to protect the barrel and stem from damage and to eliminate flooding of area when hydrant is struck or knocked off by vehicular equipment or other objects.

E. Setting Hydrants:

1. Hydrants shall be placed at the locations indicated on the Plans in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians will be minimized. The contractor shall install proper "bury" hydrants or shall use, at no cost to the **County**, proper length extensions to ensure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of these Specifications. When placed behind curb, the hydrant barrel shall be set such that no portion of the pumper or hose nozzle caps shall be less than 6 inches, nor more than 12 inches from the gutter face of the curb. The contractor shall place gravel as shown on the Plans. All pipe connecting the fire hydrant to the main line shall be ductile iron pipe meeting the requirements of these Specifications or approved connecting pieces.

2. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main shall be through either a ductile iron tee or a tapping sleeve and shall include an outlet valve at the point of connection. Using a tapping sleeve where the Plans indicate a tee shall not result in any additional costs to the **County**.

F. Connection to main: Each fire hydrant shall be connected to the main with a 6-inch ductile iron branch connection. Gate valves shall be used on fire hydrant branches unless otherwise specified.

G. Drainage: Stone no larger than 4 inches in diameter, shall be placed around the base of the fire hydrant for a depth of 30 inches from the bottom of the trench and shall extend for a distance of 30 inches from the back of the hydrant toward the main.

H. Anchoring and Bracing: The shoe of each fire hydrant shall be braced against unexcavated earth at the end of the trench with stone slabs or poured concrete; or it shall be tied to the pipe with suitable metal tie rods or clamps or both, as directed by the **County**. The straps and rods, nuts and threads, used for anchoring shall be coated with protective materials at the end of installation.

I. Painting, Coating, and Lubricating:

1. All iron parts of the hydrant inside and outside shall be cleaned and thereafter, unless otherwise stipulated, all surfaces, except the exterior portion above the ground line, shall be coated or painted with, or dipped in an asphalt or bituminous base paint or coating. If these parts are painted, they shall be covered with two coats, the first being allowed to dry thoroughly before the second coat is applied.

2. The outside of the hydrant valve above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two coats of Koppers primer 621or approved equal. After installation, each hydrant shall be painted with two field coats of Glamortex Enamel as manufactured by the Inertol Company or approved equal, color shall be silver. The top cap of each hydrant shall be painted in one of the following colors to indicate the main size: 6-inch or 8-inch mains shall be silver; 10-inch or 12-inch mains shall be yellow; and 16-inch or greater mains shall be green.

3. All bronze, threaded contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rustproof compound to prevent damage in shipment and storage.

J. Accessories: The **Contractor** shall furnish one standard four-sided hydrant wrench for each ten hydrants installed or fraction thereof.

K. Testing: All fire hydrants shall be tested in strict accordance with the requirements of AWWA C502, with no additional cost to the **County**. A Certificate of Compliance shall be furnished to the **County**.

2.08 GATE VALVES (GV)

A. Twenty Inches in Diameter and Smaller:

1. Gate valves shall be resilient-seated type conforming to the requirements of AWWA C509 or AWWA C515.

2. Valves through 12 inches in diameter shall have a minimum rated working pressure of 200 psi. Sixteen-inch and 20-inch valves shall have a minimum rated working pressure of 150 psi.

3. Valves less than 4 inches in diameter shall have threaded ends. Larger valves shall be mechanical joint unless shown otherwise on the Plans.

4. Valves shall be non-rising stem type with a 2-inch square wrench nut, and shall open left. The manufacturer shall provide an affidavit of compliance with the applicable AWWA standards.

5. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, shall impart no taste to the water, and shall conform to the requirements of AWWA C550.

6. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.

7. Valve disks shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating.

8. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.

B. Twenty-four Inches in Diameter and Larger:

1. Valves shall be double-disc type conforming to the requirements of AWWA C500.

2. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type operator. Valves shall be rated for 150 psi working pressure.

3. Valve ends shall be mechanical joint type except where restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

4. Buried valves shall be equipped with valve boxes unless access to the operator is provided by a manhole.

5. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.

6. Gate valves 24 inches in diameter and larger shall be manufactured by American R/D Gate Valve Company, Mueller, M & H Valve or equal.

2.09 BUTTERFLY VALVES (BV)

A. Unless indicated on the Plans to be 250-pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504 for Class 150B.

B. Where butterfly valves are indicated on the Plans to be 250-pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504, and as modified below. Valves shall be designed for a rated working pressure of 250 psi. Class B, AWWA C504 Section 5.2 testing requirements are modified as follows:

1. The leakage test shall be performed at a pressure of 250 psi.

2. The hydrostatic test shall be performed at a pressure of 500 psi.

3. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the **County**.

C. 150-Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Shafts shall be ASTM A76, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. The valve shall have a resilient seat.

D. 250-Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Shafts and shaft hardware shall be ASTM A564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.

E. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

F. Actuators:

1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured, and tested in accordance with the requirements of AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.

2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.

3. Valve actuators shall be capable of withstanding a minimum of 450-foot-pounds of input torque in either the open or closed position without damage.

G. Operators: Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension, as required.

H. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown on the Plans. Flange joints shall meet the requirements of ANSI B16.1, Class 125.

I. Butterfly valves shall be manufactured by Mueller (Pratt), DeZurik, or equal.

2.10 VALVE BOXES (VB) AND EXTENSION STEMS

A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5¼ inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6 inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.

B. All valves shall be furnished with extension stems if operating nut is greater than 4 feet deep, to bring the operating nut to within 24 inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A-26441 or M & H Valve Style 3801 or equal.

2.11 VALVE MARKERS (VM)

A. The **Contractor** shall provide a concrete valve marker as detailed on the Plans for each valve installed, except on hydrant isolation valves. Valve markers shall be stamped “WATER.”

2.12 TAPPING SLEEVES AND VALVES (TS&V)

A. Tapping sleeves for mains 12 inches in diameter and smaller shall be ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be equal to Mueller H-615.

B. Tapping sleeves for mains larger than 12 inches shall be of all stainless steel construction.

C. The **Contractor** shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. The tapping sleeve shall be rated for 250 psi.

D. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer.

2.13 CORPORATION COCKS AND CURB STOPS

A. Corporation cocks and curb stops shall be ball type, shall be made of bronze conforming to the requirements of ASTM B61 or ASTM B62, and shall be suitable for the working pressure of the system. Ends shall be suitable for flared tube joint. Threaded ends for inlet and outlet of corporation cocks shall conform to the requirements of AWWA C800; coupling nut for connection to flared copper tubing shall conform to the requirements of ANSI B16.26. Corporation cocks and curb stops shall be manufactured by Mueller, Ford FB-600, or equal.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES AND OBSTRUCTIONS

A. The Plans indicate utilities or obstructions that are known to exist according to the best information available. The **Contractor** shall call the Utilities Protection Center (UPC) (800-282-7411) as required by Georgia Law (O.C.G.A. Sections 25-9-1 through 25-9-13) and shall call all utilities, agencies, or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours, or 3 business days, prior to construction to verify the location of the existing utilities.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service:

1. The **Contractor** shall provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The **Contractor** shall ensure at the time of any excavation that a valid utility location exists at the point of excavation.

2. The **Contractor** shall expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. The **Contractor** shall repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.

3. The **Contractor** shall avoid utility damage and interruption by protection with means or methods recommended by the utility owner.

4. The **Contractor** shall maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The **Contractor** shall provide the **County** an updated copy of the log bi-weekly, or more frequently if required.

C. Conflict with Existing Utilities:

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The **Contractor** may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The contractor shall receive approval from the **County** for any utility relocation.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The minimum clearance shall be 12 inches. The **Contractor** may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The contractor shall receive approval from the **County** for any utility relocation.

D. Electronic Locator: The **Contractor** shall have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipelines or other obstructions.

E. Water and Sewer Separation:

1. Water mains should maintain a minimum 10-foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10-foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18 inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18 inches.

2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.02 CONSTRUCTION ALONG HIGHWAYS, STREETS, AND ROADWAYS

A. The **Contractor** shall install pipelines and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation or applicable permitting authority and the **County** with reference to construction operations, safety, traffic control, road maintenance and repair.

B. Traffic Control: Shall meet the requirements of Section 01550 and as stipulated below.

1. The **Contractor** shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the Work and the safety of the public. Flagmen shall be certified by a Georgia DOT-approved training program.

2. Construction traffic control devices and their installation shall be in accordance with the current Manual on Uniform Traffic Control Devices for Streets and Highways.

3. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation and the **County** a minimum of 48 hours in advance of the activity.

4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as “Flagmen Ahead,” shall be removed and replaced when needed.

5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.

7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the Georgia Department of Transportation and the **County**. Sign panels shall be of durable materials capable of maintaining their color, reflective character, and legibility during the period of construction.

8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the Manual on Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to ensure that they are maintained in the proper position throughout their period of use.

C. Construction Operations:

1. The **Contractor** shall perform all work along highways, streets, and roadways to minimize interference with traffic.

2. Stripping: Where the pipeline is laid along road right-of-way, the **Contractor** shall strip and stockpile all sod, topsoil, and other material suitable for right-of-way restoration.

3. Trenching, Laying and Backfilling: The **Contractor** shall not open the trench any further ahead of pipe laying operations than is necessary. The **Contractor** shall backfill and remove excess material immediately behind laying operations. The **Contractor** shall complete excavation and backfill for any portion of the trench in the same day.

4. Shaping: The **Contractor** shall reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. The **Contractor** shall replace topsoil, sod, and any other materials removed from shoulders.

5. Construction operations shall be limited to 400 feet along areas, including cleanup and utility exploration.

D. Excavated Materials: The **Contractor** shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. The **Contractor** shall sweep all scattered excavated material off of the pavement in a timely manner meeting all E&S codes

E. Drainage Structures: The **Contractor** shall keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff. E&S measures shall be maintained and the contractor is subject to clean any storm line and MH that has received siltation.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The **Contractor** shall take extreme care in moving landscape features and promptly re-establish these features.

G. Maintaining Highways, Streets, Roadways, and Driveways:

1. The **Contractor** shall maintain streets, highways, roadways, and driveways in suitable condition for movement of traffic until completion and final acceptance of the Work.

2. During the time period between pavement removal and completing permanent pavement replacement, the **Contractor** shall maintain highways, streets and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.

3. The **Contractor** shall furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.

4. The **Contractor** shall immediately repair all driveways that are cut or damaged and the **Contractor** shall maintain them in a suitable condition for use until completion and final acceptance of the Work.

3.03 PIPE DISTRIBUTION

A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.

B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the **Contractor** is actually working without written permission from the **County**. The **County** reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The **Contractor** shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets, and roadways upon which pipe is distributed.

D. No distributed pipe shall be placed inside drainage ditches.

E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than 5 feet from the roadway pavement, as measured edge-to-edge.

3.04 LAYING AND JOINTING PIPE AND ACCESSORIES

A. The **Contractor** shall lay all pipe and fittings to accurately conform to the lines and grades established by the **County**.

B. Pipe Installation:

1. Pipe shall be installed in accordance with the requirements of AWWA M11, chapter 16. Welded joints shall be in accordance with the requirements of AWWA C206.

2. Sleeve-type mechanical pipe couplings shall conform to the requirements of AWWA M11.

3. Unless otherwise specified, buried mechanical couplings and valves shall be field coated as shown on the Plans, specified in these Specifications, or as directed by the **County**.

4. Anchorage shall be provided as shown on the Plans, specified in these Specifications, or as directed by the **County**.

5. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of slings, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

6. All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be rejected by the **County** and replaced at the contractor's or manufacturer's expense

7. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.

8. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time.

9. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

10. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.

11. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.

12. The **Contractor** shall provide detection tape for all pipe greater than 12 inches in diameter. Detection tape shall be buried 4 to 10 inches deep. Should detection tape need to be installed deeper, the **Contractor** shall provide 3-inch-wide tape. In no case shall detection tape be buried greater than 20 inches from the finish grade surface.

C. Alignment and Gradient:

1. The **Contractor** shall lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. The **Contractor** shall not deflect any joint more than the maximum deflection recommended by the manufacturer.

2. The **Contractor** shall maintain a transit, level, and accessories on the site of the Work to lay out angles and ensure that deflection allowances are not exceeded.

D. Expediting of Work: The **Contractor** shall excavate, lay the pipe, and backfill as closely together as possible. The **Contractor** shall not leave un-jointed pipe in the trench overnight. The **Contractor** shall backfill and compact the trench as soon as possible after laying and jointing is completed. The **Contractor** shall backfill the installed pipe each day at the close of work and at all other times when work is not in progress. No excavation is to be left unbackfilled or unsupervised. If necessary to backfill over the end of an uncompleted pipe or accessory, the **Contractor** shall close the end with a suitable plug, either push-on, mechanical joint, restrained joint, or as approved by the **County**.

E. Joint Assembly:

1. Push-on, mechanical, flange, and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.

2. The **Contractor** shall inspect each pipe joint within 1,000 feet on either side of main line valves to ensure 100-percent seating of the pipe spigot, except as noted otherwise.

3. Each restrained joint shall be inspected by the **Contractor** to ensure that it has been “homed” 100 percent.

4. The **Contractor** shall internally inspect each pipe joint to ensure proper assembly for pipe 24 inches in diameter and larger after the pipe has been brought to final alignment.

F. Cutting Pipe: The **Contractor** shall cut ductile iron pipe using an abrasive wheel saw. The **Contractor** shall cut PVC pipe using a suitable saw; remove all burrs, and smooth the end before jointing. The **Contractor** shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories, and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

G. Polyethylene Encasement: Installation shall be in accordance with the requirements of AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the **County**.

H. Valve and Fitting Installation:

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be rejected by the **County** and replaced at the contractor’s or manufacturer’s expense. Valves shall be closed before being installed.

2. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified in this section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.

3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut, and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the **County**.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

5. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Plans or directed by the **County**, valve markers shall be installed 6 inches inside the right-of-way or easement, and buried to a depth of 30 inches as per Standard Detail No. W-8.

I. Air Valve Vaults:

1. The **Contractor** shall construct the vault or manhole as detailed on the Plans.

2. The frame and cover shall be cast into the top slab. The floor drain shall be piped to vault exterior.

3. Manholes shall be constructed such that their walls are plumb.

3.05 CONNECTIONS TO WATER MAINS

A. The **Contractor** shall make connections to existing pipelines with tapping sleeves and valves, unless specifically shown otherwise on the Plans. Before connecting to any existing water main the contractor shall receive approval from the **County**.

B. Location: Before laying pipe, the **Contractor** shall locate the points of connection to existing water mains and uncover as necessary for the **County** to confirm the nature of the connection to be made.

C. Interruption of Services: The **Contractor** shall make connections to existing water mains only when system operations permit and only when notices are issued to the customer. The **Contractor** shall operate existing valves only with the specific authorization and direct supervision of the **County**.

D. Tapping Sleeves:

1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.

2. Prior to attaching sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.

3. Before performing field machine cut, the water tightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, that will induce a test pressure as specified in this section. No leakage shall be permitted for a period of 5 minutes.

4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a 1 percent sodium hypochlorite solution.

E. Connections Using Solid Sleeves: Where connections are shown on the Plans using solid sleeves, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipeline.

F. Connections Using Couplings: Where connections are shown on the Plans using couplings, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipeline, including all necessary cutting, plugging, and backfill.

G. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line, or the existing private service line, shall be provided by the **Contractor**. To minimize out of service time, the contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

3.06 THRUST RESTRAINT

A. The **Contractor** shall provide restraint at all points where hydraulic thrust may develop.

B. Retainer Glands: The **Contractor** shall provide retainer glands where shown on the Plans. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The **Contractor** shall furnish a torque wrench to verify the torque on all set screws that do not have inherent torque indicators.

C. Harnessing:

1. The **Contractor** shall provide harness rods only where specifically shown on the Plans or directed by the **County**.

2. Harness rods shall be manufactured in accordance with the requirements of ASTM A36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.

3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, the **Contractor** shall provide 90-degree bend eye bolts.

4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.

D. Thrust Collars: Collars shall be constructed as shown on the Plans. Concrete and reinforcing steel shall meet the requirements of Sections 03200 - Concrete Reinforcement and Section 03300 - Cast-In-Place Concrete. Welded-on collar shall be designed to meet the minimum allowable load shown on the Plans. The welded-on collar shall be attached to the pipe by the pipe manufacturer.

E. Concrete Blocking as required and approved by the **County**:

1. The **Contractor** shall provide concrete blocking for all bends, tees, valves, and other points where thrust may develop in addition to thrust restraint as per Standard Detail No. W-36.

2. Concrete shall be as specified in Section 03300 - Cast-In-Place Concrete.

3. The **Contractor** shall form and pour concrete blocking at fittings as shown on the Standard Details and as directed by the **County**. The **Contractor** shall pour blocking against undisturbed earth. The **Contractor** shall increase dimensions when required by over-excavation.

3.07 INSPECTION AND TESTING

A. All sections of the water main subject to internal pressure shall be pressure tested in accordance with the requirements of AWWA C600 and these Specifications. A section of main shall be considered ready for testing after completion and curing of all thrust restraint and backfilling.

B. Water used for testing mains and washing streets will be made available to the **Contractor** at the nearest existing facilities of the Department of Watershed Management. The **Contractor** shall furnish all necessary pipe or hose extensions and transportation to the point of use and exercise care in use of the water. Water used for other purposes shall be supplied through a metered connection, which the **Contractor** shall obtain through the Department of Watershed Management Applications Office.

C. Each segment of water main between main valves shall be tested individually.

D. Test Preparation:

1. For water mains less than 24 inches in diameter, the **Contractor** shall flush sections thoroughly at flow velocities, greater than 2½ feet per second, adequate to remove debris from pipe and valve seats. For water mains 24 inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the **County**. The **Contractor** shall partially open valves to allow the water to flush the valve seat.

2. The **Contractor** shall partially operate valves and hydrants to clean out seats.

3. The **Contractor** shall provide temporary blocking, bulkheads, flanges, and plugs as necessary, to ensure all new pipe, valves, and appurtenances shall be pressure tested.

4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. The **Contractor** shall insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as shown on the Standard Details with a meter box.

5. The **Contractor** shall fill pipeline slowly with water. The **Contractor** shall provide a suitable pump with an accurate water meter to pump the line to the specified pressure.

6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure of the system. Where necessary, the **Contractor** shall provide temporary backpressure to meet the differential pressure restrictions.

7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.

E. Test Pressure: The **Contractor** shall test the pipeline at 250 psi measured at the lowest point for at least 2 hours. The **Contractor** shall maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. The **Contractor** shall provide an accurate pressure gage with graduation not greater than 5 psi.

F. Leakage:

1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

2. The **County** assumes no responsibility for leakage occurring through existing valves.

G. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

Where:
L = Allowable leakage, in gallons per hour
S = Length of pipe tested, in feet
D = Nominal diameter of the pipe, in inches
P = Average test pressure during the leakage test, in pounds per square inch (gauge)

As determined under Section 4 of AWWA C600.

H. If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results at the **Contractor**'s expense.

I. Completion: After a pipeline section has been accepted, the **Contractor** shall relieve test pressure. The **Contractor** shall record type, size, and location of all outlets on the Record Drawings.

3.08 DISINFECTING PIPELINE

A. After successfully pressure testing each pipeline section, the **Contractor** shall disinfect in accordance with the requirements of AWWA C651 for the continuous-feed method and these Specifications.

B. Specialty **Contractor**: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the **Contractor** shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water. The **Contractor** shall receive approval from the **County** where to dispose of chlorinated water.

C. Chlorination:

1. The **Contractor** shall apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. The **Contractor** shall retain chlorinated water for 24 hours. Water shall be supplied from a temporary source protected by appropriate backflow prevention devices. Backflow preventer shall be approved by the **County** prior to connection. Chlorine shall be injected no more than10 feet from the beginning of the new main.

2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24-hour period.

3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. The **Contractor** shall re-chlorinate if required results are not obtained on all samples.

D. Disposal of Chlorinated Water: The **Contractor** shall reduce chlorine residual of disinfection water to less than 1 milligram per liter if discharged directly to a body of water or to less than 2 milligrams per liter if discharged onto the ground prior to disposal. The **Contractor** shall treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. The **Contractor** shall flush all lines until residual is equal to existing system.

E. Bacteriological Testing: After final flushing and before the water main is placed in service, the **Contractor** shall collect samples from the line and have them tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. The **County** reserves the right to collect and test the samples in the **County**'s laboratory One set of samples shall be collected from every 1,200 feet of water main, plus one set from each end of main and one set from each branch. If the test results are not acceptable, the **Contractor** shall re-chlorinate lines at their cost until required results are obtained.

3.09 PROTECTION AND RESTORATION OF WORK AREA

A. General: The **Contractor** shall return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is completed. Restoration of streets, sidewalks, curb and driveways shall comply with Section 02700. Restoration of off-street areas shall comply with the requirements of Section 02920 and as stipulated below.

1. The **Contractor** shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.

2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.

4. The **County** shall be authorized to stop all work by the **Contractor** when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.

B. Man-Made Improvements: The **Contractor** shall protect, or remove and replace, with the **County**'s approval, all fences, walkways, mail boxes, pipelines, drain culverts, power and telephone lines and cables, property pins, and other improvements that may be encountered in the Work.

C. Cultivated Growth: The **Contractor** shall not disturb cultivated trees or shrubbery unless approved by the **County**. Any such trees or shrubbery that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

D. Cutting of Trees: The **Contractor** shall not cut trees for the performance of the Work except as absolutely necessary and with the approval from the **County** The **Contractor** shall protect trees that remain in the vicinity of the work from damage from equipment. The **Contractor** shall not store spoil from excavation against the trunks. The **Contractor** shall remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. The **Contractor** shall repair any damaged tree over 3 inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the site of the Work and disposed of by the **Contractor**. No stumps, wood piles, or trash piles shall be permitted on the site of the Work.

E. Disposal of Rubbish: The **Contractor** shall dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate Federal, State, and local regulatory agencies.

F. Wetlands:

1. The **Contractor** shall not construct permanent roadbeds, berms, drainage structures, or any other structures that alter the original topographic features within the easement.

2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the **Contractor**.

3. The **Contractor** shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland, or stream that may be temporarily divided by construction.

4. The **Contractor** shall not spread, discharge, or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent waterways or wetlands.

3.10 ABANDONING EXISTING WATER MAINS

A. General: The **Contractor** shall abandon in place all existing water main segments indicated on the Plans to be abandoned. The **Contractor** shall perform abandonment after the new water main has been placed in service and all water main services have been changed over to the new main. The **Contractor** shall salvage for the **County** existing fire hydrants, valve boxes, valve markers, and other materials located on water mains abandoned.

B. Capping and Plugging: The **Contractor** shall disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is directed by the **County**. The **Contractor** shall provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. The **Contractor** shall seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum 6-inch cover of concrete on all sides around the end of the pipe. The **Contractor** shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged. The abandoned pipeline shall be filled with flowable fill if directed by the **County**.

C. Salvaging Materials: The **Contractor** shall salvage existing fire hydrants, valve boxes, valve markers, and other materials located of water mains abandoned and deliver salvaged items in good condition to the **County**'s storage yard. The **Contractor** shall coordinate delivery and placement of salvaged materials in advance with the **County**.

D. Pavement Removal and Replacement: The **Contractor** shall perform any necessary pavement removal and replacement in accordance with Standard Detail No. W-43 and Section 02700 - Pavement Repairs.

+++ END OF SECTION 02665T +++

SECTION 02711
FENCING AND GATES

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for a complete installation of chain link fence and gates. All materials shall be installed and adjusted, in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

B. Contract drawings show only functional features and some of the required external connections. They do not show all components required for a complete installation nor exact dimensions particular to any manufacturer's products. The **Contractor** shall supply all parts, devices and equipment necessary to meet the requirements of the Contract Documents and shall make all dimensional adjustments particular to the materials being furnished. All costs associated with such changes and adjustments shall be considered as being included in the price bid for the Work shown and specified.

C. Related Work specified elsewhere:

Section 03300 Cast in Place Concrete

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300.

1.03 QUALITY ASSURANCE

A. Reference Standards. Comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:

1. Department of Transportation Standard Specifications for Construction of Roads and Bridges, Sections 643 and 894

B. Experience. Products furnished under this Section shall be of a design and manufacture that has been successfully used in similar applications. The manufacturer shall have furnished product for a minimum of five similar applications. Provide a list of such installations complete with installation description contact names, addresses, telephone numbers. This reference list shall be submitted with the shop drawings.

1.04 QUALITY STANDARDS

A. The chain link fence and gates shall be furnished by a single manufacturer who shall assume sole responsibility for providing a complete system designed for

long life with a minimum of required maintenance meeting the requirements specified herein and as shown on the Drawings.

B. The Manufacturer shall provide written certification that the material provided under this Specification has been amply designed and is a suitable application for these service conditions.

C. Manufacturer's offering products that comply with these specifications include:

Anchor Fence, Inc. or approved equal

1.05 WARRANTY

A. Provide a warranty against defective materials and workmanship in accordance with the requirements of the General Requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL

A. Zinc and aluminum coated steel and aluminum alloy fabric, posts, fittings, and accessories shall conform to AASHTO M 181.

2.02 FENCE FABRIC

A. All chain link fence shall consist of woven wire in the form of reasonably uniform 2-inch square mesh, having parallel sides and horizontal and vertical diagonals of approximately uniform dimensions. The wire size shall be as specified on the Drawings.

B. TYPES

1. Zinc-Coated Steel Fabric: The base metal of the fabric shall be a good commercial quality of steel wire coated with prime western spelter or better (AASHTO: M120) applied at the rate of not less than 1.2 oz. of zinc per square foot of uncoated wire surface after weaving.

- OR -

2. Aluminum-Coated Steel Fabric: The base metal of the fabric shall be a good commercial quality steel wire, coated with aluminum alloy applied at the rate of not less than 0.40 oz. per square foot of uncoated wire surface.

C. Workmanship: ChainlLink fence fabric shall be produced by methods recognized as good commercial practices. The zinc or aluminum coating shall be applied to the fabric in a continuous process and shall not be applied to the fabric in roll form. Both coated before weaving and coated after weaving fabric shall be given careful visual inspection to determine the quality of the coating. Excessive roughness, blisters, salammoniac spots, bruises, flaking bare spots or other obvious defects, to any considerable extent, shall be cause for rejection.

1. Tolerances: All dimensions, weights, and test methods shall conform with the applicable portions of AASHTO:M 181 or Federal Specification RR-F-191.

2.03 POSTS

A. Line Posts shall be 1-7/8 inch nominal galvanized steel "H" column minimum weight of 2.70 pounds per linear foot, nominal 2-3/8-inch outside diameter galvanized steel pipe, minimum weight 3.65 pounds per linear foot, or "C" section measuring 2.25 inches x 1.70 inches, minimum weight of 2.73 pounds per linear foot.

B. End, Corner and Pull Posts:

1. Zinc and aluminum coated posts shall be nominal 2-7/8 inches outside diameter galvanized steel pipe weighing a minimum of 5.79 pounds per linear foot, 2-1/2-inch square posts with a minimum weight of 5.70 pounds per linear foot or 3-1/2 inches x 3-1/2 inches rolled form sections with integral fabric loops, weighing a minimum of 5.14 pounds per linear foot.

2.04 TOP RAILS AND HORIZONTAL BRACES FOR END, CORNER AND PULL POSTS

A. Truss bracing shall be 3/8-inch round rod with suitable turnbuckle or take-up arrangement. Rods shall be of the approximate metal and coating according to the type of fence installation. All braces shall be furnished with suitable metal connections so that they can be securely fastened to the posts.

B. Top rail shall be furnished in lengths of not less than 15 feet. Each section shall be provided with a suitable expansion sleeve or coupling not less than 7 inches long. Every fifth coupling as installed shall have a heavy spring to take up expansion and contraction of the top rail.

C. Zinc and aluminum coated rails and braces shall be nominal 1-5/8-inch outside diameter steel pipe, minimum weight of 2.27 pounds per linear foot, or 1-5/8 inch x 1-1/4 inch roll formed sections weighing a minimum of 1.35 pounds per linear foot.

2.05 POST TOPS AND FITTINGS

A. All posts shall be fitted with tops designed to fit securely over the posts and carry the top rail. The tops and fittings shall be of dimensions shown on the Drawings.

2.06 FABRIC FASTENERS

A. Wire for fabric fasteners may be zinc-coated or aluminum-coated of the gauges specified.

2.07 GATES

A. Frames, posts, hinges, and fitting shall be in accordance with dimensions shown

in Federal Specification RR-F-191, unless otherwise specified.

1. Gates: Shall be provided with combination spring latch and plunger rod of approved design for padlocking.

2. Hinges: Heavy-duty malleable iron or steel, industrial service type, 270-degree swing. Provide at least three hinges on each gate leaf at vehicular gate openings.

3. Hold-Open Device: Equip designated gate openings with galvanized steel or malleable iron stop/hold open devices with catch or plunger rod of standard manufacture and approved design.

2.08 BARBED WIRE

A. Galvanized steel barb wire shall be composed of two strands of No. 12 1/2 gauge wire with round barbs, four-point pattern, spaced 5 ± 1/2 inch apart, conforming to ASTM:A 121, Class 2, or at the **Contractor's** option, may be high-tensile strength barbed wire. If the **Contractor** elects to furnish high-tensile strength bared wire, it shall meet the requirements of ASTM:A 121, with the following exceptions:

1. The coated line wires shall have a nominal diameter of 0.067 inch. The coated barb wires shall have a nominal diameter of 0.057 inch.

2. The minimum weight of zinc coating shall be 0.75 ounce per square foot for the line wire and 0.70 ounce per square foot for the barb wire.

3. The line wire shall have a minimum tensile strength of 475 pounds per individual strand.

2.09 GROUND RODS

A. Ground Rods shall be 5/8 inch in diameter but no less than 9/16 inch and shall be 8 feet in length unless otherwise shown on the Plans. Ground Rods shall be galvanized steel. Galvanizing shall have a minimum coating of 2 oz. per square foot in accordance with the requirements of ASTM:A 153.

PART 3 - EXECUTION:

3.01 GENERAL

A. Fence shall normally be constructed within the right of way line, with no portion of the permanent installation encroaching on adjacent property. When it is necessary for the **Contractor** to trespass on private property outside of the right-of-way or easements provided on the Drawings, he shall obtain permission from the property owner for such intrusion.

B. Fence shall generally follow the contour of the ground, with the bottom of fence fabric no less than one inch nor more than 6 inches from the ground surface. The fence line shall be cleared a maximum of 8 feet wide and minor grading shall be

performed where necessary to provide a neat appearance. Where abrupt changes in the ground profile in low areas make it impractical to maintain the specified ground clearance, longer posts may be used and multiple strands of barbed wire stretched thereon with vertical clearances between strands of barbed wire 6 inches or less.

C. Any of the various types of fencing materials shown in Part 2, may be used, except that posts, fabric, barbed wire, and appurtenances, including gates when required, shall be of the same or matching type for each Project, unless otherwise directed.

3.02 INSTALLATION

A. Posts shall be located and installed as called for on the Drawings. "C" and 2 3/8-inch tube type line posts for all types of fences shall be installed using concrete encasement. Posts installed in rock shall be in accordance with Article 643.03.B.3 of the DOT Standard Specifications.

1. All corner, end and pull posts shall have concrete encasement as shown in the Drawings. Posts damaged by driving shall be replaced by the **Contractor** at its expense. When posts are set in concrete, the entire hole around the post shall be filled with Class A or B concrete. Concrete may be hand mixed for batches of 1/2 yard or less. The posts shall be firmly braced and held in place until the concrete has set. Distance between end, pull, and corner or angle post assemblies shall not exceed the following:

   For Chain Link Fence, Straight Line 500 feet
   For Chain Link fence, Curved Line 250 feet

2. Posts placed on concrete walls, slabs or solid rock shall be set in round holes 12 inches deep or as indicated on the Drawings. The space around the post shall be filled with a cement filler approved by the **County**.

3. Posts shall be repaired after cutting or drilling. Galvanized steel posts shall be repaired in accordance with the manufacturer's recommendations.

B. Fence Erection: Fence fabric or barbed wire, except when posts are set in concrete footings may be installed when posts are set and braced. When posts are set in concrete footings, the installation of fabric or wire shall be delayed to allow the concrete to cure at least 5 days. When barbed wire fence is required, three strands shall be installed unless otherwise indicated on the Drawings.

C. Gates: Gate assemblies shall be of the length, height, and type designated on the Drawings, and installed so as to provide for 270-degree swing. Gate frames shall be welded units and shall be properly coated after welding. Fabric matching the fence fabric shall be stretched taut over the gate frame. Gate assemblies shall be provided with a positive type locking device, padlock and keys.

D. Electrical Ground: Whenever a power line carrying more than 600 volts passes

over the fence, a ground rod shall be installed. The ground rod shall be installed at the nearest point directly below the point of crossing. Where possible the ground rod shall be driven into the ground for a full 8 feet of penetration. In rocky soil, the rod may be driven slanted, so as to provide 18 inches of cover at the tip. If solid rock is encountered, two ground rods may be installed at the nearest post on each side of the power line crossing where soil conditions will permit. A length of No. 6 bare copper seven-stranded wire shall be attached between the fence and the ground rod with suitable clamps.

3.03 STORAGE OF MATERIALS

A. Barbed wire, wire fence fabric, steel posts, hardware, and other materials, shall not be stored in contact with the ground, but shall be placed in floored buildings, on platforms, or on wooden timbers or poles. Floors, platforms, or props shall be high enough to prevent the wire and steel posts from having any contact with the ground or surface water. Wire or steel posts which are damaged due to improper storage at any time between fabrication and final erection will be rejected. Except when rusting occurs as a result of ponding water after erection of the fence, all wire or posts that show signs of rusting before final acceptance shall be repaired, as directed by the **County**, or removed and replaced with new material at the **Contractor's** expense.

+++ END OF SECTION 02711 +++

SECTION 02920
SITE RESTORATION

PART 1 - GENERAL

1.01 SCOPE

A. This section includes disposition of materials and structures encountered in the Work; ground preparation; mulching; seeding; fence reset; cleanup; and any other similar, incidental, or appurtenant operation which may be necessary to properly complete the Work.

B. The Contractor shall provide all services, labor, materials, and equipment required for all site restoration and related operations necessary or convenient to the Contractor for furnishing a complete Work as shown on the Plans or specified in these Specifications.

C. Related Work Specified Elsewhere:

1. Section 01200 - Measurement and Payment
2. Section 02231 – Tree Protection and Trimming
3. Section 02315 - Excavation and Backfill for Structures
4. Section 02535 - Gravity Flow Sanitary Sewers
5. Section 02538 - Sanitary Sewer Service Lateral Reconnection and Repairs
6. Section 02700 - Pavement Repair
7. Section 02930 - Landscaping

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. Certificates of inspection as required by government authorities. The Contractor shall submit manufacturers' or vendors' certified analysis for soil amendments and fertilizer materials. The Contractor shall submit other data substantiating that materials comply with specified requirements.

2. Typewritten instructions recommending procedures to be established by the County for maintenance of site restoration work for one (1) full year.

3. Seed vendors certified statements for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed for each grass seed species.

4. Proposed planting schedules, indicating dates for each type of planting work during normal seasons for such work in the site of the Work. The

Contractor shall correlate with specified maintenance periods to provide maintenance from the Date of Substantial Completion. Once accepted, the Contractor shall revise dates only as approved in writing, after documentation of reasons for delays.

1.03 QUALITY ASSURANCE

A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.

1. ASTM C602 - Standard Specification for Agricultural Liming Materials.
2. Turfgrass Producers International.

B. The Contractor shall ship site restoration materials with certificates of inspection required by authorities having jurisdiction. The Contractor shall comply with regulations applicable to site restoration materials.

C. If specified site restoration materials are not obtainable, the Contractor shall submit proof of non-availability to the County together with proposal for use of equivalent material.

D. The Contractor shall package standard products with manufacturers' certified analysis. For other material, the Contractor shall provide analysis by recognized laboratory, in accordance with methods established by the Association of Official Agricultural Chemists, as applicable.

1.04 SAFETY REQUIREMENTS

A. Hazards Control:

1. The Contractor shall store volatile wastes in covered metal containers, and remove from the site of the Work daily.

2. The Contractor shall prevent accumulation of wastes that create hazardous conditions.

3. The Contractor shall provide adequate ventilation during use of volatile or noxious substances.

B. The Contractor shall conduct cleaning and disposal operations in compliance with local ordinances and environmental laws and regulations.

1. The Contractor shall not burn or bury rubbish and waste materials on the site of the Work without prior written permission from the County.

2. The Contractor shall not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditches or storm or sanitary drains.

1.05 DELIVERY

A. The Contractor shall deliver packaged materials in containers showing weight, analysis, and name of manufacturer. The Contractor shall protect materials from deterioration during delivery, and while stored at the site of the Work.

1.06 JOB CONDITIONS

A. All bare earth areas within the limit of work shall be grassed, mulched, or covered with other plant material as shown on the Plans. Final restoration of existing lawn areas (i.e. private residences, schools, and parks) shall be sod.

B. On a continuous basis, the Contractor shall maintain the site of the Work free from accumulations of waste, debris, and rubbish caused by its operations.

C. At completion of the Work, the Contractor shall remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces. The Contractor shall leave the site of the Work clean and ready for occupancy.

D. The Contractor shall proceed with the complete site restoration work as rapidly as portions of the site of the Work become available, working within seasonal limitations for each kind of site restoration work required. The Contractor will not be allowed to postpone cleanup and seeding until the end of the Work.

E. The Contractor shall determine the locations of underground utilities and perform Work in a manner which will avoid possible damage. The Contractor shall hand excavate, as required. The Contractor shall maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

F. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, the Contractor shall notify the County before planting.

G. The Contractor shall install materials during normal planting seasons for each type of site restoration work.

H. The Contractor shall plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the County. If planting of trees and shrubs occurs after lawn work, the Contractor shall protect lawn areas and promptly repair damage to lawns resulting from planting operations.

I. The Contractor may, at its option, employ additional measures (other than those specified) to prevent loss of, or damage to the Work resulting from the effects of wind and/or water. No additional compensation will be made for the employment of such additional measures.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil for site restoration may not be available at the site of the Work in sufficient quantities and shall be furnished as specified.

B. New topsoil shall be fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay, lumps, brush, weeds, and other litter, and free of roots, stumps, stones, and other extraneous or toxic matter harmful to plant growth.

C. The Contractor shall obtain topsoil from local sources or from areas having similar soil characteristics to that found at the site of the Work. The Contractor shall obtain topsoil only from naturally, well-drained sites where topsoil occurs in depths of not less than four (4) inches. The Contractor shall not obtain topsoil from bogs or marshes.

2.02 MATERIALS

A. Grass seed shall meet the requirements of the State of Georgia Seed Laws and Rules and Regulations except that the requirements as to purity, germination, and noxious weeds shall be specified in this section.

1. Quality: Grass seed quality shall be as shown in the Table 1:

Table 1

Seed	Purity Min. %	Germination Min %	Noxious Weed Max. Per Lb.
Sahara Bermuda Grass	98	90	None
Annual Rye Grass	98	90	None
Rebel II Turf Type Fescue	85	85	None

2. Seed shall be approved by the County before sowing. Seed shall have been tested by the Georgia Department of Agriculture, and no seed will be acceptable with a date of test more than six (6) months prior to the date of sowing. Such testing, however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meet the requirements of these Specifications at the time of sowing seed. When required by the County, samples of seed shall be furnished by the Contractor early enough before seeding to permit further testing before the seed is used. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may choose to increase the rate of seeding to obtain the minimum pure live seed content specified, provided that such an increase in seeding rates does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seeding.

3. Seed which has become wet or moldy or otherwise damaged will not be acceptable.

B. All fertilizer shall be of the grades specified and shall meet the requirements of the State Plant Food Act in effect thirty (30) days prior to the taking of bids. It shall be uniform in composition, dry and free flowing and shall be delivered to the site of the Work in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which is caked or otherwise damaged, making it unsuitable for use, will not be accepted.

C. Mulch shall meet the following requirements:

1. Be acceptable to the County.
2. Be of such consistency that, when properly loosened, it can be distributed in a uniform application.
3. Be capable of producing the desired results.
4. Meet State and Federal Quarantine Restrictions pertaining to fire ants, Japanese beetles, and white fringed beetles.
5. Shall have a moisture content of twelve (12) percent or less.
6. Contain no excessive amounts of noxious weed seeds.
7. All materials shall carry the following certification: "This material is certified as free for movement under the State and Federal Imported Fire Ant, Japanese Beetle, and White Fringed Beetle Quarantines."
8. Mulch shall be either threshed rye, oat straw, wheat straw, or Bermuda grass hay.

D. Agricultural lime shall be a pulverized limestone having the following properties:

1. Total carbonate, not less than eighty-five (85) percent.
2. Passing ten (10) mesh screen at least one-hundred (100) percent.
3. Passing one hundred (100) mesh screen at least twenty-five (25) percent.

E. Hydro mulch: Wood cellulose fiber containing no germination, inhibiting or growth inhibiting agent. Characteristics shall be as follows:

1. Percent moisture content: 9.0% (± 3.0%).
2. Percent organic matter: 9.2% (± 0.8%).
3. Percent ash content: 1.08% (± 0.2%).
4. pH: 4.8 (± 0.5).
5. Water holding capacity: 1150 grams water/100 grams fiber minimum.

F. Sod. Sod shall meet the requirements of Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, Section 700 and 890, latest edition.

2.03 GRASSING

A. Grass seed shall be as specified on the table below depending on the season or as instructed by the County. See Table 2 for seasonal application rates:

Table 2		
Season	**Type of Seed**	**Application: lbs. per Acre**
Jan. 1 – May 15	Rebel II Turf Type Fescue	250
May 16 – Sept. 15	Sahara Hybrid Bermuda Grass	75
Sept. 16 – Dec. 31	Rebel II Turf Type Fescue	250

B. Disturbed Area Stabilization (Temporary Seeding) shall be planted with seeds listed in Table 2.

PART 3 - EXECUTION

3.01 DISPOSITION OF MATERIALS AND STRUCTURES ENCOUNTERED IN THE WORK

A. Existing materials or structures that may be encountered (within the lines, grades, or trenching sections established for completion of the Work), if unsuitable or unacceptable to the County for use in the Work, and for which the disposition is not otherwise specified, shall either be disposed of by the Contractor or shall remain the property of the County as further provided in this section.

B. At the option of the County, any existing materials or structures of "value" encountered in the Work, shall remain the property of the County. The term "value" shall be defined by the County.

C. Any existing materials or structures encountered in the Work, and determined not to be of "value" by the County, shall be disposed of by the Contractor, in an approved manner, except as otherwise specified in Section 02200 - Site Preparation.

3.02 GROUND PREPARATION

A. All ground to be sodded, sprigged, over seeded, or grassed shall be prepared by plowing, disking, and harrowing to a depth or not less than six (6) inches. After plowing, topsoil shall be spread on the prepared area to a depth of four (4) inches, and smoothed to a uniform depth. The finished surfaces shall present a smooth, uniform, loose, well broken soil. All large clods, boulders, stumps, large roots, roots, debris, and other particles two (2) inches in diameter or greater and which will interfere with the Work shall be removed from the site of the Work.

B. Lime shall be uniformly spread over the area to be planted or sowed at the rate of 2000 pounds per acre. Grad 5-10-10 or approved equal fertilizer shall also be uniformly spread over the area at the rate of 1500 pounds per acre or as recommended by the manufacturer. The fertilizer and the lime shall then be thoroughly mixed into the top six (6) inches of the soil. All surface areas distorted by mixing of line and fertilizer into the soil shall be restored to the proper line and grade before any more work is done on the area.

3.03 MULCHING

A. The quantity of mulch to be applied shall be that required to evenly cover the ground to a depth of at least three (3) quarters of an inch and not more than one and one-half (1½) inches, according to the texture and moisture content of the mulch material. It is intended that mulch allow some sunlight to penetrate and air to circulate while at the same time shading the ground and conserving soil moisture.

B. Mulch shall be uniformly applied manually or with special blower equipment. When a blower is used, baled material shall be thoroughly loosened before it is fed into the machine so as to obtain a uniform coating of mulch and to prevent placement of unbroken clumps. After initial distribution, thick clumps which are dense enough to prevent new grass from emerging shall be loosened and redistributed. Mulch shall not be applied on windy days when the velocity of the wind is sufficient to prevent uniform distribution of mulch.

C. Hydro mulch: If Hydro mulch is used, it shall be mixed to provide equivalent quantities of fertilizer and seed as specified in this section.

3.04 SEEDING

A. Seed shall be uniformly sown at the rates specified, by the use of approved mechanical seed drills, rotary hand seeders, or other type of equipment that will produce a uniform application of the seed. Distribution by hand will not be permitted.

B. In order to obtain an even distribution, seeds shall be sown separately except that seeds of approximately the same size may be mixed and sown together. No sowing shall be done during windy weather which prevents even distribution of the seeds, when the prepared surface is crusted, frozen, wet, or otherwise in non-tillable condition.

C. Immediately after seeding, all areas shall be rolled.

D. Watering: After seeding of areas are complete, watering shall be continued daily as long as necessary to promote a rapid growth except that no water shall be applied between the hours of 10 A.M. and 4 P.M. to prevent “crushing over” from the sun.

E. First Application of Nitrogen (All areas): The first application of nitrogen shall be made on all areas when there is evidence that a satisfactory stand of grass will be obtained. For seeded areas, the young grass shall have reached a height of at least 1 inch. At this time, nitrate of soda, or other approved commercial fertilizer high in nitrogen content shall be applied at a rate sufficient to furnish 70 pounds of nitrogen per acre. No fertilizer shall be applied to unsatisfactory areas that will have to be replanted.

F. Second Application of Nitrogen (all areas): A second application of nitrogen shall be made 30 days after sufficient moisture has been applied to make the first application available for plant growth. Second application shall also furnish 70 pounds of nitrogen per acre.

G. Maintenance: The **Contractor** shall provide all maintenance necessary to keep all seeded and turf areas in a healthy, satisfactory and weed-free condition until the Work is finally accepted. This includes, repairing washed-out areas, and correctly applying additional seed, fertilizer, and water if they are needed.

H. Satisfactory Stand Defined:

1. A stand of grass will be considered satisfactory only by the **County** and if there is full cover over the seeded area with perennial grass that is alive and growing, leaving no bare spots larger than 1 square foot or the total of all bare spots within a given area shall constitute no more than 1/100 of the total area.

2. If it is necessary to repeat any or all of the work necessary to produce a viable stand of perennial grass, including repairing washed-out areas, soil preparation, re-fertilizing, liming, re-seeding, sprigging, watering, or mulching, the **Contractor** shall repeat these operations until satisfactory stand is obtained and approved by the **County**.

I. The **Contractor** shall remove all stumps, fallen trees, uprooted trees, dead trees, and debris from the edge of the right-of-way.

3.05 SOD

A. Furnish and install sod in all lawn areas or as designated by the **County**.

1. Use only Common Bermudagrass (*Cyndon dactylon*) or one of the following Bermudagrass varieties:
   a. Tifway 419
   b. Tifway II
   c. Tift 94
   d. Tifton 10
   e. Midlawn
   f. Midiron
   g. GN-1
   h. Vamont

2. No dwarf Bermuda types shall be used. Sod shall be nursery grown and accompanied with a Georgia Department of Agriculture Live Plant License Certificate or Stamp. Sod shall consist of live, dense, well-rooted material free of weeds and insects as described by the Georgia Live Plant Act.

3. Place sod by hand or by mechanical means so that joints are tightly abutted with no overlaps or gaps. Use soil to fill cracks between sod pieces, but do not smother the grass.

4. Once sod is placed and staked as necessary, tamp or roll it using adequate equipment to provide good contact with soil.

5. Use caution to prevent tearing or displacement of sod during this process. Leave the finished surface of sodded areas smooth and uniform.

B. After the sod has been placed and rolled or tamped, water it to promote satisfactory growth. Additional watering shall be provided in the absence of rainfall and during the hot dry summer months. Water may be applied by Hydro Seeder, Water Truck, or by other means approved by the **County**.

C. Sod will be inspected by the **County** at the end of the first spring after installation and at the time of Final Inspection. Replace any sod that is not live and growing. Any cost for replacing any unacceptable sod shall be at the **Contractor's** expense.

D. Apply nitrogen at approximately 50 pounds per acre when specified by the **County** after plants have grown to 2 inches high. One application is mandatory and shall be applied before Final Acceptance. Apply nitrogen with mechanical hand spreaders or other approved spreaders capable of uniformly covering the grassed areas. Nitrogen shall not be applied on windy days or when foliage is damp, nor between October 15 and March 15.

3.06 FENCE RESET

A. Should the construction of the sewer require or result in removal or damage to an existing fence, the **Contractor** shall replace the fence in kind to the satisfaction of the fence owner.

3.07 CLEANUP

A. During site restoration work, the **Contractor** shall keep pavements clean and the site of the Work in an orderly condition.

B. The **Contractor** shall protect site restoration work and materials from damage due to site restoration operations, operations by other contractors, and trades and trespassers. The **Contractor** shall maintain protection during installation and maintenance periods. The **Contractor** shall treat, repair, or replace damaged site restoration work as directed by the **County**.

C. Throughout the progress of the Work, the **Contractor** shall keep the construction area, including storage areas used by the **Contractor**, free from accumulations of waste material or rubbish, and shall keep its materials and equipment in a neat and orderly manner. Immediately upon completion of any section of the Work and before payment therefore has been made, the **Contractor** shall remove from the site of the Work all construction equipment, temporary structures, and debris, and shall restore the site of the Work to a neat condition; the **Contractor** shall not remove barricades and warning and direction signs until directed by the **County**. The **Contractor** shall not postpone cleanup and seeding until the end of the Work. Waste materials shall be disposed of at locations satisfactory to the **County** or affected regulatory agencies.

D. After completion of all Work contemplated under the Contract and before final payment has been made, the **Contractor** shall make a final cleanup of each separate part of the Work; shall restore all surfaces to a neat and orderly condition; and shall remove all construction equipment, tools, and supplies.

3.08 INSPECTION AND ACCEPTANCE

A. When site restoration work is completed, including maintenance, the **County** will, upon request, make an inspection to determine acceptability.

B. Where inspected site restoration work does not comply with the requirements of the **County**, the **Contractor** shall replace rejected work and continue specified maintenance until reinspected by the **County** and found to be acceptable. The **Contractor** shall remove rejected plants and materials promptly from the site of the Work.

+++ END OF SECTION 02920 +++

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION

A. Provide, finish, protect, and cure cast-in-place concrete as indicated and specified.

B. Provide, finish, protect and cure cast-in-place concrete indicated and specified under electrical work.

1.02 RELATED WORK

A. Division 1: General Requirements

B. Section 03100: Concrete Formwork

C. Section 03200: Concrete Reinforcement

D. Section 03250: Construction and Expansion Joints

E. Section 03255: Polyvinyl Chloride Waterstops

F. Section 03256: Hydrophilic Rubber Waterstops

G. Section 03345: Concrete Floor Treatment

H. Section 04200: Unit Masonry and Accessories

1.03 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

2. ACI 214: ecommended Practice for Evaluation of Strength Test Results of Concrete

3. ACI 301: Standard Specifications for Structural Concrete

4. ACI 304R: Guide for Measuring, Mixing, Transporting and Placing Concrete

5. ACI 305R: Hot Weather Concreting

6. ACI 306R: Cold Weather Concreting

7. ACI 308: Standard Practice for Curing Concrete

8. ACI 309R: Guide for Consolidation of Concrete

9. ACI 311.4R: Guide for Concrete Inspection

10. ACI 318: Building Code Requirements for Structural Concrete

11. ACI 350: Code Requirements For Environmental Engineering Concrete Structures

B. American Society for Testing and Materials (ASTM) Publications:

1. A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

2. A 153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

3. C 31: Standard Practice for Making and Curing Concrete Test Specimens in the Field

4. C 33: Standard Specification for Concrete Aggregates

5. C 39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

6. C 40: Standard Test Method for Organic Impurities in Fine Aggregates for Concrete

7. C 42: Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

8. C 87: Standard Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

9. C 88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

10. C 94: Standard Specification for Ready-Mixed Concrete

11. C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens)

12. C 123: Standard Test Method for Lightweight Particles in Aggregate

13. C 136: Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

14. C 138: Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete

15. C 143: Standard Test Method for Slump of Hydraulic Cement Concrete

16. C 150: Standard Specification for Portland Cement

17. C157: Standard Test Method for Length Change of Hardened Hydraulic Cement, Mortar and Concrete

18. C 171: Standard Specification for Sheet Materials for Curing Concrete

19. C 172: Standard Practice for Sampling Freshly Mixed Concrete

20. C 192: Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

21. C 231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

22. C 260: Standard Specification for Air-Entraining Admixtures for Concrete

23. C 289: Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)

24. C 295: Standard Guide for Petrographic Examination of Aggregates for Concrete

25. C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

26. C 311: Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete

27. C 494: Standard Specification for Chemical Admixtures for Concrete

28. C 595: Standard Specification for Blended Hydraulic Cements

29. C 618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

30. C 882: Standard Test Method for Bond Strength of Epoxy Resin Systems Used with Concrete by Slant Shear

31. C 989: Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

32. C 1064: Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete

33. C 1107: Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

34. D 75: Standard Practice for Sampling Aggregates

35. E 154: Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

36. E 329: Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction

C. American Association of State Highway and Transportation Officials (AASTO):

1. AASHTO M182:

D. National Sanitation Foundation (NSF):

1. ANSI/NSF 61: Drinking Water System Components – Health Effects

1.04 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Section 01300 - Submittals:

1. Name and address of proposed **Contractor's** testing laboratory firm and a brief description of prior work that is similar to that proposed for this project. Provide prior work owner's full name, address, and telephone number. ASTM E 329 will also be used as one of the bases for evaluating the testing laboratory firm.

2. Concrete design mixes and results of strength tests from trial concrete mixes by the **Contractor's** testing laboratory firm.

3. Concrete design mixes and results of drying shrinkage tests from trial concrete mixes by the **Contractor's** testing laboratory firm.

4. Material test results by the **Contractor's** testing laboratory:

a. Fineness modulus of fine aggregate per ASTM C 136

b. Fine aggregate organic impurities per ASTM C 40

c. Fine aggregate mortar strength per ASTM C 87 and ASTM C 109

d. Quality of fine and coarse aggregates per ASTM C 33.

B. Mill test reports for each shipment of cement, regardless of quantity, prior to incorporation into the Work.

C. Manufacturer's specifications and instructions for all admixtures, curing materials, adjustable inserts and non-shrink non-metallic grout. Manufacturer's certification of compatibility of all admixtures.

D. Manufacturer's fly ash or pozzolan chemical analysis and results of physical test reports in conformance with ASTM C 311 and as specified herein for each shipment of fly ash or pozzolan, prior to incorporation into the Work.

1.05 QUALITY ASSURANCE

A. Provide in accordance with Section 01065 – Structural Tests and Inspections, Section 01400 – Quality Assurance, and as specified herein.

B. Perform concrete work in conformance with ACI-301 unless otherwise indicated or specified.

C. Do not use admixtures, including calcium chloride, that will cause accelerated setting of cement in concrete.

D. Do not place concrete until design mix, material tests and trial concrete batch mix compression test results are approved by the **County**. Approvals are required at least 30 days before placing any production concrete.

E. The **Contractor** shall employ an independent testing laboratory, acceptable to the **County**, to test conformity of materials to specifications and to design concrete mixes. Concrete testing shall be performed by and an ACI Concrete Field Technician, Grade I or equivalent.

F. Furnish, pay for, and deliver representative samples of sufficient quantity of cement, aggregates and admixtures required for trial concrete batch mixes to the testing laboratory. Obtain materials from the concrete batching plant that will be supplying production concrete in conformance with ASTM D 75.

G. The testing laboratory shall furnish trial concrete design mixes having proportions, admixtures and slump proposed for use, based upon ACI 211.1. Furnish at least three different water-cement ratios that will produce a range of strengths, aggregate sizes and admixture combinations encompassing those required for the work. Report design mixes for maximum permitted air, slump and temperature of concrete used in trial batches.

H. Produce new concrete design mixes at no additional cost to the **County** when job site concrete is not of the required strength. Provide additional testing when original sample materials produce unsatisfactory results or new material sources are to be used. All additional testing shall be done by the same testing laboratory and paid for by the **Contractor**.

I. Measure all materials for concrete, including water, with equipment and facilities suitable for accurate measurement and capable of being adjusted in conformance with ASTM C 94. Use scales certified by local Sealer of Weights and Measures within one year of use and accurate when static load tested to plus or minus 0.4 percent of total capacity of scale. Batch all materials by weight, except admixtures that may be batched by volume.

J. The approved testing agency shall take control test specimens, conduct slump tests, and measure air content and temperature in the field.

K. Methods of Sampling and Testing:

1. Fresh Concrete Sampling: ASTM C 172

2. Specimen Preparation: ASTM C 31

3. Compressive Strength: ASTM C 39

4. Air Content: ASTM C 231

5. Slump: ASTM C 143

6. Temperature: ASTM C 1064

7. Unit Weight: ASTM C 138

8. Obtaining Drilled Cores: ASTM C 42

9. Drying Shrinkage: ASTM C 157

L. Acceptance of Structure: Acceptance of completed concrete work requires conformance with dimensional tolerances, appearance, and strength, as indicated or specified.

M. Hot weather concrete shall conform to ACI 305R and as specified herein.

N. Cold weather concrete shall conform to ACI 306R and as specified herein.

O. Concrete delivered to the job site that exceeds the time limit specified shall be rejected.

P. Concrete delivered to the job site that exceeds the concrete temperature limitations specified shall be rejected.

Q. Concrete shall not be placed in water or on frozen or disturbed ground.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide in conformance with Section 01610 – Delivery Storage and Handling, and as specified herein.

B. Order concrete from batching plant so that trucks arrive at discharge locations when concrete is required. Avoid excessive mixing of concrete or delays in placing successive layers of concrete in forms.

C. Deliver concrete to discharge locations in watertight agitator or mixer trucks without altering the specified properties of the water-cement ratio, slump, air entrainment, temperature, and homogeneity.

D. Reject concrete not conforming to specification, unsuitable for placement, exceeding the time or temperature limitations, or not having a complete delivery batch ticket.

1.07 JOBSITE CONDITIONS

A. Do not place concrete until conditions and facilities for making and curing control test specimens are in compliance with ASTM C 31 and as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Furnish Portland cement conforming to ASTM C 150. Use one approved brand from one mill throughout the contract term unless otherwise approved by the **County**. Use cement of uniform color.

1. Use Type II for all work, unless otherwise indicated or specified.

2. Reject the entire shipment when cement is lumpy, wetted, partially, or wholly set.

3. For mix designs containing fly ash, pozzolans or ground granulated blast-furnace slag, use Type II cement with fly ash or pozzolan as a cement replacement.

B. Water:

1. Use water for concrete that is potable and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances, and that conforms to the requirements for water in ASTM C 94, and as specified herein.

2. The maximum water-soluble chloride ion in the water shall not exceed 0.060 percent by weight of cement.

3. Heat or cool water to obtain concrete temperatures indicated or specified, and in conformance with ACI 305R and ACI 306R.

C. Aggregates:

1. Use fine aggregates for normal weight concrete consisting of well-graded natural sand conforming to ASTM C 33 and to the following requirements:

a. Fineness modulus: 2.50 to 3.10

b. Organic impurities: Color intensity not darker than 2/3 standard color solutions, nor darker than Organic Plate No. 2, determined by ASTM C 40.

c. Soundness:Maximum of 10 percent weighted average loss after five cycles of magnesium sulfate soundness test as determined by ASTM C 88.

D. Use coarse aggregates for normal weight concrete consisting of washed, well-graded gravel or crushed stone conforming to ASTM C 33 and to the following requirements:

1. Soundness: Maximum of 14 percent weighted average loss after five cycles of magnesium sulfate soundness test as determined by ASTM C 88.

2. Test aggregates for chert in conformance with ASTM C 33 as determined by ASTM C 123.

E. Admixtures:

1. General Requirements:

a. Maintain compressive strength and maximum water-cement ratios indicated in Table 03300-1 when using admixtures. Include all admixtures in solution form in the water-cement ratio calculations.

b. Do not use calcium chloride, admixtures containing chloride ions, or other admixtures causing accelerated setting of cement. Do not use combinations of admixtures and cements producing erratic or otherwise undesirable results with aggregates.

c. Reject admixtures that have been in storage for longer than manufacturer's recommendations or have been subjected to freezing.

d. Do not use admixtures in greater dosages than recommended by manufacturer.

e. The strength of concrete with proposed admixtures after 48 hours shall not be less than the strength of similar concrete without admixture.

f. All admixtures shall be obtained from one manufacturer. The manufacturer shall be capable of providing qualified field service representation.

g. Admixtures shall be used in compliance with the manufacturer's printed instructions. The manufacturer shall certify the compatibility of multiple admixtures used in the same mix.

2. Air-Entrainment:

a. Air entrain all concrete. Use admixtures conforming to ASTM C 260.

b. Provide total air content by volume in field mixtures of normal weight concrete:

5 ± 1½ percent for concrete using 1-1/2-inch (38-mm) maximum aggregate size.

6 ± 1½ percent for concrete using ¾-inch (19-mm) maximum aggregate size.

c. Measure air content in accordance with ASTM C 231.

d. Adjust the admixture content to accommodate the fly ash or pozzolan requirements, and other admixtures when used, in order to obtain the specified air content.

3. Mid-Range Water Reducer: Use admixture conforming to ASTM C 494, Type A.

4. High Range Water Reducer (Super Plasticizer): Use admixture conforming to ASTM C 494, Type F, extended slump life.

F. Curing Compound: Liquid form, which will form an impervious membrane over the exposed surface of concrete when applied to fresh concrete by means of a spray gun. The compound shall not inhibit future bond of floor covering or concrete floor treatment. Use Type I-D compound with red fugitive dye, Class B, having 18-percent minimum solids conforming to ASTM C 309.

G. Evaporation Retardant shall be:

1. Confilm as manufactured by Master Builders.

2. Eucobar as manufactured by Euclid Chemical Company

3. SikaFilm as manufactured by Sika Corporation

4. Or approved equal

H. Waterproof Curing Sheet: Waterproof paper polyethylene film or white burlap-polyethylene film conforming to ASTM C 171.

I. Cloth, Burlap, Jute or Kenaf: Curing materials conforming to AASHTO M182.

J. Curing mats shall be heavy carpets or cotton mats, quilted at 4 inches on center. Curing mats shall weight a minimum of 12 ounces per square yard when dry.

K. Dovetail Anchor Slots: Provide 24-gage (0.70 mm), foam-filled, hot-dip galvanized steel dovetail anchor slots. Dovetail anchor slots shall be compatible with dovetail anchors specified in Section 04200. Dovetail anchor slots shall be manufactured by:

1. The Dayton Sure-Grip & Shore Co.

2. Heckmann Building Products, Inc.

3. Hohmann & Barnard Inc.

4. Or approved equal

L. Adjustable Inserts: Adjustable inserts shall be hot-dip galvanized in conformance with ASTM A 123 and A 153. Adjustable inserts shall be:

1. Ductile iron wedge inserts, Type F-7 manufactured by The Dayton Sure-Grip & Shore Co.

2. Malleable iron wedge inserts, Type HW manufactured by Hohmann & Barnard Inc.

3. Malleable iron peerless wedge inserts manufactured by Richmond Screw Anchor Co., Inc.

4. Or approved equal

M. Non-shrink, Non-metallic Grout: Commercial formulation requiring only addition of water with minimum 28-day compressive strength of 5,000 psi conforming to ASTM C 1107, Grade A, B or C. Grout shall be:

1. Five Star grout manufactured by U.S. Grout Corp.

2. SikaGrout 212 manufactured by Sika Corporation.

3. Masterflow 928 Grout manufactured by Master Builders

4. Or approved equal

N. Vapor Retarder: 10 mil (0.25 mm) polyethylene sheet conforming to ASTM E 154.

O. Blast Furnace Slag: Provide grade 120 blast furnace slag in conformance with ASTM C 989.

P. Fly Ash: Provide fly ash conforming to the following requirements:

1. Class F fly ash conforming to ASTM C 618 for chemical and physical properties.

2. Supplemental requirements in percent:

a.	Maximum carbon content	3%
b.	Maximum sulfur trioxide (SO_3) content	4%
c.	Maximum loss on ignition	3%
d.	Maximum water requirement (as a percent of control)	100%

e. Fineness, maximum retained on No. 325 sieve — 25%

2.02 MIXES

A. Use ready-mixed, air-entrained concrete secured from a batching or mixing plant conforming to ASTM C 94 capable of developing specified characteristics and being placed without segregation.

B. Concrete Strengths:

1. Use 4,000-psi (28-MPa) concrete for all work unless otherwise indicated or specified.

2. Use 4,500-psi (31-MPa) concrete for all water containment structures unless otherwise indicated or specified.

3. Use 4,000-psi (28-MPa) concrete for all concrete fills and toppings, unless otherwise indicated or specified.

4. Use 1,500-psi (10-MPa) concrete for concrete under foundations or whenever low strength concrete is indicated, specified or permitted by the Engineer.

C. Secure, for every part of work, concrete of homogeneous structure having the required strength, water tightness, and durability.

D. Use the following coarse aggregate sizes for concrete:

1. 1-½ inches (38 mm) for walls greater than 30 inches (750mm) in thickness, grade beams, footings, foundation mats, and base slabs

2. 3/4 inches (19 mm) for all other concrete

3. 3/8 inches (10 mm) in congested areas where approved by the **County** and for fireproofing around structural steel beams and columns and to fill cored holes

E. Provide concrete meeting the requirements in Table 1.

TABLE 1

Minimum compressive strength at 28 days (psi)	Minimum compressive strength at 28 days (MPa)	Maximum water cement ratio*
1,500	10	0.76
3,000	20	0.53
4,000	28	0.45
4,500	31	0.42

*Total water in mix at time of mixing, including free water in the aggregates and liquid admixtures.

F. Consistency: Mix concrete to produce homogeneous consistency, capable of being worked into constricted areas of forms, corners and around embedded items, without segregation or bleeding of free water.

G. Fly ash or pozzolan shall not exceed 15 percent of the combined weight of fly ash, pozzolan, or ground granulated blast-furnace slag and cement.

H. Concrete Slump: Provide concrete with a maximum slump of 4 inches. Provide concrete using water reducing admixtures with a maximum slump of 4 inches before addition of the water reducer and a maximum slump of 6 inches after the addition of a mid-range water reducer or a maximum slump of 8 inches after the addition of a high range water reducer. Determine the concrete slump in conformance with ASTM C 143.

2.03 CONCRETE TOLERANCES

A. Conform to the requirements specified in Section 03100 – Concrete Formwork for finish tolerances for formed surfaces.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Batch, mix and deliver Portland cement concrete in conformance with ASTM C 94. Batch all constituents at a central batching or mixing plant. Produce concrete in conformance with ACI 301 and as specified herein.

B. Seasonal Conditions:

1. Conform to ACI 305R and as specified herein for hot weather concreting. Do not add retarder admixture to any concrete.

2. Conform to ACI 306R and as specified herein for cold weather concreting. Do not add accelerator admixture to any concrete.

3. Do not place concrete containing pozzolan during cold weather concreting, as defined in ACI 306R.

3.02 FORMS

A. Provide and remove all formwork as specified in Section 03100 – Concrete Formwork.

3.03 JOINTS AND EMBEDDED ITEMS

A. Provide construction and expansion joints as specified in Section 03250 – Construction and Expansion Joints:

1. Clean all construction joints to remove loose concrete and laitance before placing adjoining concrete. Do not damage exposed concrete edges, key grooves, waterstops or reinforcement.

2. Do not place concrete against construction joints for at least 72 hours after initial concrete set.

B. Embedded Items:

1. Clean embedded items of oil and all foreign matter.

2. Install inserts, anchors, sleeves and other items into formwork where indicated or specified under other sections of these specifications.

3. Do not embed aluminum items in concrete.

4. Complete required tests on embedded piping before starting concrete placement.

5. Check location and support of piping, electrical conduits and other embedded items before depositing concrete. Correct locations as required and secure in place.

C. Embedded Pipes And Conduit:

1. Embedded pipes and conduit in concrete shall conform to the requirements and limitations of ACI 318, ACI 350 and these specifications and shall be as approved by the engineer.

2. Conduits, pipes, and sleeves of any material not harmful to concrete and within the limitations specified herein shall be permitted to be embedded in concrete with the approval of the **County**.

3. Conduits, pipes and sleeves of aluminum shall not be embedded in concrete.

4. Pipes passing through walls of a liquid-containing structure shall include an integral waterstop.

5. Conduits, pipes, and sleeves passing through a slab, wall, or beam shall not significantly impair the strength of the construction.

6. Conduits and pipes, with their fittings, embedded within a column shall not displace more than 4 percent of the area of cross section.

7. Except when drawings for conduits and pipes are approved by the structural engineer, conduits and pipes embedded within a slab, wall, or beam (other than those merely passing through) shall satisfy the following:

a. Conduits and pipes shall not be larger in outside dimension than 1/3 the overall thickness of the slab, wall, or beam in which they are embedded.

b. Conduits and pipes shall not be spaced closer than 3 times the outside diameters on center.

c. Conduits and pipes shall be placed within the middle third of the element and between reinforcement layers. Do not install runs of piping or conduit between formwork and reinforcement.

d. Avoid crossing pipes and conduit in concrete.

8. Pipes and fittings shall be designed to resist the effects of the material, pressure, and temperature to which they will be subjected.

9. No liquid, gas, or vapor, except water not exceeding 90 F or 50 psi pressure, shall be placed in the pipes until the concrete has attained its design strength.

10. Reinforcement with an area not less than 0.002 times area of concrete section shall be provided perpendicular to piping or conduit at a maximum spacing of 12 inches (300 mm).

11. Piping and conduit shall be fabricated and installed so that cutting, bending, or displacement of reinforcement from its proper location will not be required.

12. Close the ends of conduits, piping, and sleeves embedded in concrete with caps or plugs prior to concrete placement.

3.04 VAPOR RETARDER

A. Install vapor retarder material under all interior floor slabs on ground, whether indicated on the drawings or not.

B. Install material with 6 inches (150 mm) lap at joints, and seal joints with tape as recommended by the vapor retarder manufacturer. Tape material cut for slab penetrations to the pipe, conduit or other items passing through the slab. Use tape recommended by the vapor retarder manufacturer.

C. Install vapor retarder without punctures or tears and protect against punctures and breaks.

3.05 TRANSPORTING AND MIXING

A. General: Conform to concreting procedures set forth in ACI 304R and as specified herein.

1. Transport concrete to discharge locations without altering the specified properties of water-cement ratio, slump, air entrainment, temperature, and homogeneity.

2. Discharge concrete into forms within 1-1/2 hours after cement has entered the mixing drum or before the drum has revolved 300 revolutions after the addition of water, whichever occurs first. Do not exceed the maximum water content in the approved concrete design mix. Water may be added at the jobsite with the engineer's approval and the concrete ticket, showing the water in reserve to meet the mix design water to cement ratio.

3. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time is necessary, in conformance with the following:

   a. Reduce maximum mixing and placement time from 90 to 45 minutes maximum when concrete temperature at the time of placement is between 85 and 90 degrees Fahrenheit.

   b. Reject concrete with a temperature in excess of 90 degrees Fahrenheit.

B. Conveying: Convey concrete from the agitator or mixer truck to place of final deposit in forms by one of the following methods:

1. Buckets or hoppers with discharge gates having a clear opening equal to not less than one-third the maximum interior horizontal area or five times the maximum aggregate size being used, whichever is greater, and side slopes of not less than 60 degrees to horizontal.

2. Buggies or wheelbarrows equipped with pneumatic tires.

3. Round bottom, metal or metal-lined chutes with inclined slope of between 2 to 3 feet horizontally to 1 foot vertically and of sufficient capacity to avoid overflow.

4. Circular drop pipes with a top diameter of at least eight times the maximum aggregate size, but not less than 6 inches (150 mm), or tapered to not less than six times maximum aggregate size. Do not drop concrete more than 5 feet (1.5 meters) without drop pipes.

3.06 CONCRETE ACCEPTANCE

A. The **Contractor** shall accept or reject each batch of concrete delivered to the point of agitator or mixer truck discharge. The signature of a **Contractor's** authorized representative on the delivery batch ticket shall indicate concrete acceptance.

B. The **Contractor** shall reject concrete delivered without a complete concrete delivery batch ticket as specified herein. The concrete supplier will furnish copies of the signed batch ticket to the **Contractor** and the **County**.

C. The approved testing agency shall perform field tests at the point of agitator or mixer truck discharge. Accept or reject concrete on the basis of conformity with slump, air content, and temperature specified.

D. The approved testing agency shall inspect concrete transit truck's barrel revolution counter and gauge for measuring water added to the concrete. Reject concrete that exceeds the maximum barrel revolution of 300 or that has water content exceeding the specified water-cement ratio.

E. The **Contractor** shall reject concrete exceeding the time or temperature limitations specified.

F. The **Contractor** shall reject concrete not conforming to specification before discharging into the forms.

3.07 PLACING

A. Intentionally roughen surfaces of set concrete in a manner to expose bonded aggregate uniformly at all joints where keys or keyways are not provided.

B. Deposit concrete into its final position in conformance with ACI 304R and as specified herein. Place concrete in horizontal layers 1-1/2 to 2 feet (450 to 600 mm) thick maximum completely across forms. Avoid inclined layers and cold joints. Place concrete at lower portion of slope first on sloping surfaces.

1. Do not deposit partially hardened concrete in forms. Retempering of partially hardened concrete is not permitted. Remove all partially hardened concrete from site at no additional compensation.

2. Do not allow concrete to fall freely in forms to cause segregation (separation of coarse aggregate from mortar). Do not move concrete horizontally more than 4 feet from point of discharge. Space points of deposit not more than 8 feet apart.

3. Do not splash forms and reinforcing above level of concrete being placed. Regulate placing of concrete so that pressure caused by wet concrete will not distort or deflect forms beyond finish tolerances specified in Section 03100 – Concrete Formwork, or result in leakage of the cement paste.

C. Pump Concrete:

1. Use equipment and procedures and schedule deliveries to maintain steady flow of concrete at the discharge end of pipe.

2. Maintain concrete properties of slump, air content and temperature. Make adjustments in concrete proportions as necessary to provide concrete properties in accordance with the approved concrete design mix and as specified herein.

3. Do not pump concrete through aluminum piping.

4. Use pipe having a diameter at least three times the maximum coarse aggregate size, but no less than 4 inches.

5. Take samples at the point of agitator or mixer truck discharge.

6. Furnish labor and assistance as required by the testing laboratory in obtaining and handling test specimens.

D. Consolidation:

1. Consolidate concrete using mechanical vibrators operated within the mass of concrete and/or on the forms conforming to procedures set forth in ACI 309R and as specified herein.

2. Conduct vibration in a systematic manner with regularly maintained vibrators. Furnish sufficient backup units at job site. Use vibrators having minimum frequency of 8,000 vibrations per minute and of sufficient amplitude to consolidate concrete. Use not less than one vibrator with crew for each 35 to 40 cubic yards (25 to 30 cubic meters) of concrete placed per hour.

3. Insert and withdraw vibrator vertically at a uniform spacing over the entire area of placement. Space distances between insertions such that spheres of influence of each insertion overlap. Dragging the vibrator shall not be allowed.

4. Place concrete in horizontal lifts. Insert vibrator rapidly to bottom of layer, and at least six inches into underlying layer. Hold stationary for several seconds, and then withdraw at a rate of about 3 inches (75 mm) per second. Conduct vibration to produce concrete of uniform texture and appearance, free of honeycombing, streaking, cold joints, or visible lift lines.

5. Use additional vibration with pencil vibrators on vertical surfaces and on all exposed concrete to bring full surface of mortar against the forms so as to eliminate air voids, bug holes and other surface defects. Employ the following additional procedures for vibrating concrete as necessary to maintain proper consolidation of concrete:

    a. Reduce distance between internal vibration insertions and increase time for each insertion.

    b. Insert vibrator as close to face of form as possible without contacting form or reinforcement.

    c. Thoroughly vibrate area immediately adjacent to waterstops without damaging the waterstop.

    d. Use spading as a supplement to vibration where particularly difficult conditions exist.

3.08 TESTING

A. General:

1. The approved testing agency will use concrete samples provided by the **Contractor** at the point of agitator or mixer truck discharge to perform slump, air content, and temperature tests and for field control test specimens.

B. Notification of Delivery:

1. Notify the **County** of concrete deliveries a minimum of 48 hours in advance of the scheduled placement. Include within this notification, the mix design and quantity of concrete, method and location of placement, frequency of trucks, ordered slump and time of initial delivery. The **Contractor** shall also notify the approved testing laboratory firm of scheduled concrete deliveries.

2. Place concrete during normal working hours whenever possible. Notify the **County** of special conditions at least 48 hours in advance of placement when concrete placement schedules require concrete placement at times other than during normal working hours.

3. Furnish delivery batch ticket to the representative from the approved testing laboratory or to the Engineer's representative in the field with each batch delivered to the discharge locations in conformance with ASTM C 94. Batch tickets shall be written in ink or computer printed. Batch tickets bearing any information written in pencil will be sufficient cause for rejection of the load.

4. Batch tickets shall include the following information:

   a. Load number, truck number, and driver's name

   b. Strength of concrete (compression strength)

   c. Amount of concrete (cubic yards or cubic meters)

   d. Time truck was charged with cement

   e. Revolution counter reading at first addition of water

   f. Type, brand, and amount of cement

   g. Type, brand, and amount of admixtures

   h. Information necessary to calculate total mixing water

   i. Maximum size of aggregate

   j. Weights of fine and coarse aggregates

   k. Signature of ready-mix representative

   l. Concrete temperature at batching plant

   m. Type and amount of fly ash, pozzolan, or ground granulated blast-furnace slag

   n. Mix design number or code

C. Test Measurements at Discharge:

1. The approved testing laboratory firm shall measure concrete slump, air content, and temperature for each load of concrete. The laboratory will conduct the slump, air content, and temperature test measurements in conformance with ASTM C 143, ASTM C 231, and ASTM C 1064, respectively.

2. The approved testing laboratory firm will submit test reports of concrete field measurements specified above to the **Contractor** and the **County**.

D. Control Test Specimens:

1. The approved testing laboratory firm will cast a minimum of one set of four field control test specimens in conformance with ASTM C 31 for each 50 cubic years (38 cubic meters) of each mix design of concrete, but not less than once a day nor less than once for each 5,000 square feet (450 square meters) of surface area of foundation mats, base slabs, footings, pile caps, slabs on grade, grade beams, walls, or elevated slabs.

2. Laboratory personnel shall record the truck and load number from the delivery batch ticket, the concrete placement location of each specimen, the date, concrete strength, slump, air content, and temperature.

3. The **Contractor** shall furnish tightly constructed 6-inch (150-mm)-diameter-by-12-inch (300 mm)-long non-absorbent test cylinder molds. Use molds of same type and manufacture for all test specimens. Leave molds on cylinders until they are received in testing laboratory.

4. The **Contractor** shall furnish boxes for initial curing of test cylinders in conformance with ASTM C 31 from the time of fabrication until they are transported to the testing laboratory.

5. The approved testing agency will compression test one of each set of four specimens at 7 days. Immediately notify the **Contractor** and the County if the 7-day strength is deficient. Test two of the remaining cylinders at 28 days for concrete strength acceptance. The acceptance test result is the average of the strengths of the two specimens tested at 28 days. The laboratory shall submit compression test results of the control test specimens to both the **Contractor** and the **County**. Evaluation and acceptance of concrete shall conform to ACI 301 and ACI 318. The fourth cylinder shall be held for testing at 56 days only if the 28-day cylinder strengths are deficient. The fourth cylinder of each set shall be discarded if the 28-day strengths exceed the specified minimum.

6. The **Contractor** may take field control test specimens for small quantities of concrete only if approved by the **County**.

E. Concrete Coring:

1. The **Contractor** will be directed by the **County** to take concrete cores at least 2 inches (50 mm) in diameter from the structure in conformance with ASTM C 42 should the control test specimen's compression test fail to be in compliance with the Contract Documents or if the **County** detects deficiencies in the concrete.

2. Obtain at least three representative cores from each member or area of concrete that is considered potentially deficient.

3. Obtain additional cores to replace cores that show evidence of having been damaged subsequent to or during removal from the structure.

4. The **County** will determine the core locations.

5. Remove all anchors used to secure coring machine to concrete and patch holes as specified herein.

6. The approved testing laboratory firm shall compression test the cores taken from the structure in conformance with ASTM C 39. The approved testing laboratory firm will submit test strength test results of cores specified above to the **Contractor** and to the **County**.

7. All costs associated with coring and testing by the approved testing laboratory will be borne by the **Contractor** at no additional cost to the **County.**

F. Load Testing:

1. The **Contractor** will be directed by the **County** to conduct a load test of the structure in conformance with ACI 318 under the direction of the approved testing firm should compression tests of concrete cores taken from the structure fail to be in compliance with ACI 301 and ACI 318.

2. The structure will be removed from the site and replaced should the load test fail. All costs associated with testing, removal and replacement of the structure will be borne by the **Contractor** at no additional cost to the **County**.

3.09 CURING AND PROTECTION

A. General:

1. Protect concrete from premature drying, hot or cold temperatures, and mechanical injury, beginning immediately after placement and maintain concrete with minimal moisture loss at relatively constant temperature.

2. Comply with curing procedures set forth in ACI 301, ACI 308 and as specified herein.

3. Perform hot weather concreting in conformance with ACI 305R and as specified herein when the ambient atmospheric temperature is 80 ^{o}F (25^{o} C) or above.

4. Perform cold weather concreting in conformance with ACI 306R and as specified herein when the ambient atmospheric temperature is 40 ^{o}F (5 ^{o} C) or below.

B. Duration:

1. Start initial curing after placing and finishing concrete as soon as free moisture has disappeared from unformed concrete surfaces. Initial curing starts as soon as concrete achieves final set. Forms left tightly in place are considered as part

of the curing system, provided that wooden forms are kept continuously moist. Keep continuously moist for not less than 72 hours.

2. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures for a total curing period, initial plus final, of at least 10 days.

3. Avoid rapid drying at the end of the final curing period.

C. Curing Requirements:

1. Unformed Surfaces: Cover and cure entire surface of newly placed concrete immediately after completing finishing operations and water film has evaporated from surface or as soon as marring of concrete will not occur. Protect finished slabs from direct rays of the sun to prevent checking, crazing, and plastic shrinkage.

2. Formed Surfaces: Minimize moisture loss for formed surfaces exposed to heating by the sun by keeping forms wet until safely removed. Keep surface continuously wet by warm water spray or warm water saturated fabric immediately following form removal.

3. Water containment and below Grade Structures: Moist cure by the application of water to maintain the surface in a continually wet condition. Use water that is free of impurities that could etch or discolor exposed concrete surfaces.

4. Other concrete: Moist cure by moisture retaining cover curing, or by the use of curing compound. Use curing compound for water containment and below grade structures only in cold weather after the initial curing period or when approved by the **County**, in writing.

D. Curing Methods :

1. Water Curing: Use warm water curing for unformed surfaces. Continuously water cure all exposed concrete for the entire curing period. Provide moisture curing by any of the following methods:

a. Keeping the surface of the concrete continuously wet by ponding or immersion.

b. Continuous water-fog spray or sprinkling.

c. Covering the concrete surface with curing mats, thoroughly saturating the mats with water, and keeping the mats continuously wet with sprinklers or porous hoses. Place curing mats so as to provide coverage of the concrete surfaces and edges, with a 4-inch lap over adjacent mats. Weight down the curing cover to maintain contact with the concrete surface, as necessary.

E. Sealing Materials:

1. Use common sealing materials such as plastic film or waterproofing (kraft) paper when approved by the Engineer.

2. Lap adjacent sheets a minimum of 12 inches (500 mm). Seal edges with waterproof tape or adhesive. Use sheets of sufficient length to cover sides of concrete member.

3. Place sheet materials only on moist concrete surfaces. Wet concrete surface with fine warm water spray if the surface appears dry before placing sheet material.

4. The presence of moisture on concrete surfaces at all times during the prescribed curing period is proof of acceptable curing using sheet material.

F. Membrane Curing Compound:

1. Provide a copy of manufacturer's certification that the curing compound meets the requirements of ANSI/NSF 61 for concrete surfaces that will be in contact with potable water.

2. Apply membrane curing compound uniformly over concrete surface by means of roller or spray at a rate recommended by the curing compound manufacturer, but not less than 1 gallon per 150 square feet (1 liter per 4 square meters) of surface area. Agitate curing material in a supply container immediately before transfer to the distributor and thoroughly agitate it during application for uniform consistency and dispersion of pigment.

3. When curing compound is authorized for application to water retaining or below grade members, it shall be applied at the manufacturer's recommended coverage rate and then applied again at the same rate to provide twice the recommended coverage.

4. Do not use curing compounds on construction and expansion joints or on surfaces to receive liquid hardener, dustproofer/sealer, concrete paint, tile, concrete fills, and toppings or other applications requiring positive bond.

5. Reapply membrane curing compound to concrete surfaces that have been subjected to wetting within 3 hours after curing compound has been applied by method for initial application.

6. Maintain the continuity of the coating and repair damage to the coating during the entire curing period.

G. Protection from environmental conditions: Maintain the concrete temperature above 50 degrees F (10 degrees C) continuously throughout the curing period. Make arrangements before concrete placing for heating, covering, insulation, or housing as required to maintain the specified temperature and moisture conditions continuously for the curing period.

1. When the atmospheric temperature is 80 degrees F and above, or during other climatic conditions that will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering.

2. Protect the concrete continuously for the entire curing period.

3. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes.

4. Avoid temperature changes in concrete that exceed 5 degrees F (3 degrees C) in any one hour and 50 degrees F (10 degrees C) in any 24-hour period.

H. Protection from physical injury: Protect concrete from physical disturbances such as shock and vibration during curing period. Protect finished concrete surfaces from damage by construction equipment, materials, curing procedures and rain or running water. Do not load concrete during the curing process without written permission from the design engineer.

I. Protection from Deicing Agents: Do not apply deicing chemicals to concrete.

3.10 REPAIR

A. General: Repair all surface defects immediately after form removal. Surface defects include tie holes, air voids and bug holes with a nominal diameter or depth greater than 1/4 inch (6 mm), honeycombed areas, visible construction joints, fins, burrs, color and texture variations, and other defects as determined by the **County**. Make concrete repairs in concrete surfaces to produce a uniform color and texture and free of all irregularities.

B. Surface defects in all concrete surfaces that in the opinion of the engineer adversely affect the durability of the concrete shall be repaired per the requirements of this section. Such surface defects that require repair include all visible cracks in tank floors and walls and the exterior envelope of structures below grade, regardless of width; and cracks in all other areas in excess of 0.02-inch-wide, honeycomb, rock pockets, holes left by tie rods and bolts, and spalls.

C. Repair of Cracks:

1. Cracks that have resulted from overstress conditions and are structural in nature shall be pressure grouted using an approved injectable epoxy.

2. Cracks in water retaining or below grade members tbhat have resulted from shrinkage stresses, and that show any sign of leakage, or are positioned such that leakage cannot be observed, shall be pressure grouted using an approved hydrophilic resin.

3. Cracks in other members tbat have resulted from shrinkage stresses and exceed 0.020 inch in width shall be pressure grouted using an approved hydrophilic resin.

4. Apply crack repair materials in accordance with the manufacturer's directions and recommendations.

D. Repair of Defective Areas:

1. Remove rock pockets, honeycombed and other defective concrete down to sound concrete. Chisel edges a minimum of 1 inch (25 mm) deep perpendicular to the surface or slightly undercut. Do not feather edges.

2. Dampen the area to be patched and area at least 6 inches (150 mm) wide surrounding it for at least 24 hours to prevent absorption of water from patching mortar.

3. Concrete repair material shall be a prepackaged polymer-modified cementitious repair mortar with the following minimum properties:

a. Compressive strength at one day: 2000 psi (ASTM C 109).

b. Compressive strength at 28 days: 6000 psi (ASTM C 109).

c. Bond strength at 28 days: 1800 psi (ASTM C 882 modified).

d. Provide a copy of manufacturer's certification that the repair material meets the requirements of ANSI/NSF 61 for concrete surfaces that will be in contact with potable water.

4. Use no more mixing water than necessary for handling and placing. Mix patching mortar and allow it to stand ,with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

5. Brush bond coat of neat cement well into the surface after surface water has evaporated from the area to be patched. Consolidate mortar into place and strike off so as to leave the patch slightly higher than the surrounding surface to permit initial shrinkage. Leave patch undisturbed for at least 1 hour before final finish. Keep the patched area damp for a minimum of 7 days.

E. Tie Holes: Fill tie holes solid with non-shrink, non-metallic patching mortar after cleaning and dampening.

F. Core Holes: Roughen concrete surface, clean, and dampen for at least 24 hours. Fill core holes with the specified repair mortar. Wet cure for 7 days after placement. Fill anchor holes completely with non-shrink, non-metallic patching mortar after cleaning and dampening.

G. Final determination as to acceptability of concrete finishes and repair of surface defects shall be made by the **County**.

3.11 FINISHES

A. General: Dusting with dry cement or other mixtures or water addition during finishing is not permitted.

B. Formed Surfaces:

1. Provide rough form finish on concrete surfaces not exposed to view.

2. Provide smooth form finish on interior surfaces of tank or containment walls.

3. Provide smooth form rubbed finish on concrete surfaces exposed to view.

C. Unformed Surfaces:

1. Provide float finish to surfaces scheduled to receive waterproofing, roofing, insulation, or sand-bed terrazzo.

2. Provide scratched finish to surfaces scheduled to receive concrete fills and toppings.

3. Provide steel-trowel finish to all top, horizontal, and inclined surfaces not otherwise specified or indicated. This includes concrete fills and toppings and floors. Provide hand steel-trowel finish to all surfaces such as weirs or walls over which liquids will flow.

4. Provide broom finish to exterior walkways, exterior stairs, entrance platforms, and loading docks.

D. Descriptions:

1. Rough Form Finish: Patch tie holes and defects. Chip or rub off fins exceeding 1/2 inch in height. Leave surfaces with the texture imparted by the forms.

2. Smooth Form Finish: Patch tie holes and defects. Remove fins flush with parent concrete and make necessary repairs. Wet and rub finned and repaired areas as described for smooth form rubbed finish, below.

3. Smooth Form Rubbed Finish: Patch tie holes and defects. Remove fins flush with parent concrete. Wet surface and rub with carborundum stone or other abrasive until uniform color and texture are produced. Complete rubbing not later than 24 hours after the curing period. Use no cement grout other than cement paste drawn from the concrete itself by the rubbing process

4. Float Finish: Prepare surfaces by tamping to force coarse aggregate away from surface, screeding with straight edges to bring surfaces to required line. Begin floating with a hand float, a bladed power float equipped with float shoes, or a

powered disk float when the bleed water sheen has disappeared and the surface has stiffened sufficiently to permit the operation.

5. Scratched Finish: Provide float finish then roughen the surface with stiff brushes or rakes before the final set.

6. Steel-Trowel Finish: Remove excess laitance from surfaces by tamping, screeding and magnesium, or bull floating. Compact surface with motor-driven floats when the slab has hardened so that water and fine material will not work to the top and trowel it smooth. Hand-trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled. Leave surfaces with smooth hard finish free of blemishes.

7. Broom Finish: Steel-trowel the surface, then broom normal to the direction of travel so as to produce a non-slip surface of uniform appearance.

3.12 METALWORK IN CONCRETE

A. Secure castings, inserts, conduits and other metalwork encased in concrete to prevent metalwork from being displaced or deformed during concrete work.

B. Set anchor bolts by means of templates.

C. Build dovetail anchor slots into new concrete against which facing brick, concrete masonry units, tile, stone or any type ashlar is to be installed. Provide vertically at 16-inch (400-mm) centers where facing brick, etc., passes by concrete. Provide one continuous anchor slot where facing brick, etc., abuts the concrete work.

D. Aluminum embedded in concrete shall be coated to prevent galvanic corrosion with a zinc chromate primer and one of the following products:

1. Bitumastic Super Service Black by Koppers Co., Inc.

2. Tarmastic 100 by Porter Coatings Division, Porter Paint Co.

3. 450 Heavy Tnemecol by Tnemec Company.

4. Or approved equal

3.13 CONTRACT CLOSEOUT

A. Provide in accordance with Section 01700 – Contract Closeout.

+++END OF SECTION 03300+++

SECTION 13110
CATHODIC PROTECTION

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes requirements for installation of corrosion control systems for pipelines.

1.2 QUALITY ASSURANCE

A. Materials:
   1. Shall follow applicable Standards for corrosion control.
   2. Shall be supplied by manufacturer regularly engaged in production of corrosion control materials.

B. Installer: Install test stations, insulating joints, anodes, and joint bonding under supervision of corrosion control technician or corrosion engineer experienced in corrosion control work.

C. Corrosion Control Testing: Performed by NACE International Certified Corrosion Specialist, Senior Corrosion Technologist, or corrosion engineer with minimum 5 years experience in corrosion engineering.

1.3 SUBMITTALS

A. Submit following Section 01330.
   1. Catalog Data and/or Cuts.
      a. Materials for joint bonding, joint insulation, anodes and reference cells.
      b. Thermite weld packages, including manufacturer's recommended cartridge and charge size for each application required.
      c. Test stations.
   2. Certification that magnesium anodes meet requirements of ASTM B843 and zinc anodes meet requirements of ASTM B418 and specifications noted herein.

B. Submit following Section 01450.
   1. Certificates:
      a. Installer and tester qualifications.
      b. Applicable NACE International Corrosion Certifications.
   2. Methods and procedures for testing corrosion control system, including description of instruments and equipment to be used. a. Test procedures for;
      1) Verifying electrical isolation at insulating joints and insulating casing spacers.
      2) Post-installation testing of test stations and cathodic protection system.
      3) Continuity testing (joint bond resistance).
   3. List of at least five projects that involve testing of corrosion control systems. Documentation for each project shall include:
      a. Project name
      b. Project location (City and State)

c. Pipe diameters and type of pipe material installed
d. Length of pipeline
e. Type of corrosion control provided on the pipeline
f. Name and phone number of a contact at the pipeline owner
g. Names of responsible corrosion control company staff members that participated in the project

C. Submit all test results in a Final Acceptance Report for **County** approval.
1. Include sketches of test station wire terminations in each test box.
a. Number each test station and identify the type of station.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wire
1. Bonding Wire: Single conductor No. 2 or No. 4 AWG stranded copper rated at 600 volts with High Molecular Weight Polyethylene (HMWPE) black insulation. Wire size and length following Standard Detail C/1.0.
2. Test Lead Wires: Single conductor No. 6 through No. 12 AWG stranded copper rated at 600 volts with THW, THHN, THWN or HMWPE insulation. Wire sizes and insulation colors following Standard Details and Drawings.
3. Magnesium Anode Header Wire: Single conductor No. 8 AWG stranded copper wire rated at 600 volts with HMWPE black insulation for multiple galvanic anode installations, length as required.

B. Exothermic (Thermite) Weld Materials.
1. Exothermic Weld Molds, Weld Powder, and Weld Metal Cartridges: Use proper mold and proper size and amounts for wire size, pipe size, pipe material, and weld position. Utilize adapter sleeves as recommended by the exothermic weld manufacturer.
2. Approved Manufacturers:
a. Exothermic weld material:
i. ERICO International - CADWELD products
ii. Continental Industries - thermOweld products
iii. Or equal
b. Weld powder: As recommended by each exothermic weld manufacturer for specific wire size and pipe material.
c. Exothermic Weld caps:
1) Continental Industries, Division of Burndy LLC – Ci thermOcap or Ci theromOcap PC weld caps.
2) Royston Laboratories Division, Chase Corporation – Royston Handy Cap or Royston Handy Cap IP.
3) Or equal.
d. Exothermic weld cap, pre-filled with mastic.
1) Royston Handy Cap – use Royston Roybond 747 primer
2) Royston Handy Cap IP – no primer needed (has integrated primer)
3) Ci thermOcap – use thermOprimer primer.
4) Ci thermOcapPC – no primer needed (pre primed cap)

e. Other exothermic weld caps: Field fill with mastic, following manufacturer's instructions.

C. Terminals, Terminations, and Connectors:
1. Terminals for terminating test lead wires in test boxes: one-piece, burr-free, crimp-type, non-insulated brazed seam terminals for ¼-inch terminal studs, made of annealed electrolytic copper, sized to match various wire and stud sizes.
2. Wire terminations for bolted connections: One piece bar lugs made of electrolytic grade copper bar stock and tin-plated, assembled or fabricated before field delivery.
a. Approved Manufacturer.
i. ERICO, Type LA
ii. Or equal
3. Compression Connectors: One-piece "C"-shaped manufactured from high conductivity wrought copper for splicing copper cables together.
4. Approved Manufacturer:
1) Burndy, Type YC-C
2) Or equal

D. Insulating Materials.
1. Flange insulating kit.
a. Flange Insulating Gasket: Full flange diameter, Type E, made of laminated phenolic with neoprene on each side of gasket with minimum total thickness of 1/8 inch.
1) Dielectric strength: Not less than 500 volts per mil
2) Compressive strength: Not less than 24,000 psi
3) Water absorption: Maximum 2.5 percent
4) Approved manufacturers/suppliers:
a) Advance Products & Systems, Inc.
b) Central Plastics Company
c) Pipeline Seal and Insulator, Inc. (PSI)
d) Or approved equal
b. Insulating Flange Bolt Sleeves: High-density polyethylene or spiral wrapped Mylar with dielectric strength not less than 1,200 volts per mil.
c. Insulating Flange Bolt Washers: High-strength phenolic with minimum thickness of 1/8-inch, dielectric strength not less than 500 volts per mil, and compressive strength not less than 25,000 psi.
d. Steel Flange Bolt Washers for placement over insulating washers: Minimum thickness of 1/8 inch and cadmium plated.
e. One Piece Combination Sleeve and Washer, only when noted on Drawings.
1) One-piece sleeve and washer of molded acetyl or nylon resin having a minimum thickness of 1/8 inch.
a) Dielectric strength not less than 500 volts per mil.
b) Compressive strength not less than 15,000 psi.
2. Copper House Connections and Small Pipe Insulator.
a. Copper house connection insulator: Two brass parts and nylon dielectric bushing.
b. Insulator for other pipe, 2 inches and smaller in diameter: one-piece threaded bushing made of nylon and sized to fit pipe.

E. Casing Spacers: See Section 02445.

F. Casing End Seals: See Section 02445.

G. Polyethylene Mesh Separator Pad.
1. Medium-density flexible polyethylene mesh pattern webbing pad, nominal thickness 160 mils.
a. Approved Manufacturer:
1) Stuart Steel Protection Corporation, Model Stuart Diamond Rockstop
2) Or equal

H. Electrical Tape
1. Conformable water-tight sealant having dielectric strength not less than 15kV for 1/8-inch-thick layer.
a. Approved Products.
I. Scotch Vinyl Electrical Tape Super 88
II. Scotch Linerless Rubber Splicing Tape 130C
III. Or equal

I. Test Stations: Flush mounted.
1. Tube: Follow Standard Details.
2. Cast iron or high impact plastic collar with ribs.
3. Cast iron or high-impact plastic locking lid, blue with permanent marking "COUNTY TEST STATION" to withstand AASHTO H-20 traffic loads and ultra \violet rays.
4. Terminal Block: Phenolic resin, plastic, Micarta, Lexan, or Bakelite high dielectric material, with minimum of seven terminals, unless otherwise shown on Drawings.
5. Terminals: Nickel-plated brass 1/4-inch threaded studs, nuts, and washers.
6. Shunt: 0.01 ohm with minimum of 6 amperes capacity in test stations with galvanic anodes following Drawings.

J. Reference Electrodes
1. Permanent copper-copper sulfate reference electrode.
a. Designed for minimum 20-year life.
b. Size: 2 inches diameter by 8 inches long, Schedule 80 PVC body or 2 inches diameter by 7 inches long, high impact resistant Lexan tube and minimum overall package size of 6 inches diameter by 10 inches long.
c. Prepackaged in permeable cloth bag with special copper-copper sulfate reference electrode backfill.
d. Contents: High-purity copper element, 99.99 percent pure, inside a tube containing super saturated solution of copper sulfate.
e. Lead wire:
i. Sufficient length to reach test station terminals without splicing.
ii. Attached to electrode core with manufacturer's standard connection. Connection shall be stronger than the wire.
2. No splicing of electrode lead wire permitted under any circumstances.
f. Approved Manufacturer.
I. Electrochemical Devices, Inc., Model UL-CUG-SW
II. Or equal

K. Magnesium Anodes:
   1. Magnesium bar in prepackaged backfill with test lead wire.
   2. Nominal weight, excluding backfill: As shown on Drawings.
   3. Each anode: Vibratory packaged in water permeable cardboard box or water permeable fabric sack, containing a minimum of 40 pounds of backfill of the following composition:
      a. Hydrated Gypsum 75%
      b. Bentonite 20%
      c. Sodium Sulfate 5%
   4. Lead Wire: No. 12 AWG 600 volts solid copper wire with THW, THWN, or THHN white insulation, at least 10 feet long, and factory connected to galvanized steel core with silver brazing alloy with minimum silver content of 15 percent.
      a. Lead wire: Sufficient length to reach anode header cable without splicing.
   5. Chemical Composition of Magnesium Anodes: (percent by weight)

Aluminum	0.01 Maximum
Zinc	0.05 Maximum
Manganese	0.50-1.30
Copper	0.02 Maximum
Silicon	0.05 Maximum
Iron	0.03 Maximum
Nickel	0.001 Maximum
Others	0.050 each or 0.300 Maximum Total
Magnesium	Balance

L. Zinc Anodes for Ductile Iron to PCCP Adapters
   1. Zinc bar in prepackaged backfill with test lead wire.
   2. Each anode shall have a nominal weight of 9 pounds, excluding backfill, installed as shown on Drawings and Standard Details.
   3. Each anode: 12 inches long by 6 inches wide by 0.50 inches high.
   4. Each anode: Vibratory packaged in water permeable cardboard box 18 inches long by 10 inches wide by 10 inches tall containing minimum of 25 pounds of backfill of the following composition:
      a. Hydrated Gypsum 75%
      b. Bentonite 20%
      c. Sodium Sulfate 5%
   5. Lead Wire: No. 12 AWG 600 volts solid copper wire with THW, THWN, or THHN white insulation, at least 10 feet long, and factory connected to galvanized steel core with silver brazing alloy with minimum silver content of 15 percent.

6. Lead wire: Sufficient length to reach adapter without splicing.
7. Chemical Composition of Zinc Anodes: (percent by weight)
   Aluminum 0.005 Maximum
   Iron 0.0014 Maximum
   Copper 0.002 Maximum
   Lead 0.003 Maximum
   Cadmium 0.003 Maximum
   Zinc Balance
8. Approved Manufacturer
   a. M&M Industries, Inc.
   b. Or equal

M. Zinc Anodes (for AC Ground Mats):
   1. Zinc ribbon: ASTM B418, Type II composition.
      a. 0.6 lbs/ft with cross section of 0.5 inch by 0.5625 inch.
      b. Continuously extruded over wire core of 0.13-inch-diameter centrally located in the zinc alloy.

N. Detectable Warning Tape for Coated Pipe and Test Station lead wires: See this section and Section 02315

PART 3 EXECUTION

3.1 THERMITE WELDING OF WIRES

A. Thermite weld test lead and joint bond wires to ductile iron and steel pipe joints and fittings, except where limited use of lugs is permitted following Standard Details.
   1. This weld process may be specified for use on other metallic structures.

B. Thermite welding equipment: Follow equipment manufacturer's instructions and Standard Details.
   1. Use equipment and molds to accommodate wire size, metallic structure's shape, wire position of attachment (vertical or horizontal) and other criteria specified.
   2. Before a mold is used, remove and clean slag, dirt, and other foreign matter from mold.
   3. Cartridge and charge size: Based on manufacturer's recommendations for specific application. Note: Different charges are required for steel and ductile iron.

C. Surface Preparation:
   1. Surfaces with little or no coating:
      a. Clean to bare metal by grinding or filing area approximately 3 inches square to produce bright metal surface.
      b. Remove coating, dirt, mill scale, oxide, grease, moisture, and other foreign matter from weld areas.
   2. Surfaces with high performance or thick coating: Cut a 4-inch-square window through the coating and clean a 3-inch-square surface to bright metal, avoiding damage to the surrounding coating.

D. Preparation for Welding.

1. Before welding, remove wire insulation as required to fit mold, avoiding damage to exposed copper wire.
2. If wire is cut or nicked over half way through its diameter, cut off and strip new end.
3. If manufacturer requires use of copper sleeve, crimp it securely to wire and remove excess wire protruding from end of sleeve.

E. Test Connection.
1. After charge is set, remove mold and chip slag from weld area with welder's hammer.
2. Strike top and sides of weld with hammer to test bond of connection.
3. If weld does not hold, remove scrap weld material, clean, and begin the weld process again.
4. After welding and before coating cleaned weld area, the **County** may test joint bond wires for electrical continuity.

F. Weld Caps.
1. After the weld has passed tests for soundness and electrical continuity, clean the thermite weld and area around it.
2. Apply pre-filled weld cap or field mastic-filled weld cap over thermite weld following manufacturer's recommendations.
3. Coat remaining exposed pipe metal surface with petrolatum or petroleum wax mastic. Follow Field Applied Coating procedure in Section 02510.
4. Repair damage to pipe coating following coating manufacturer's recommendations.
5. If weld cap will not fit due to physical space limitations, coat bare metal and wire in weld area with minimum ¼-inch thickness of petrolatum or petroleum wax mastic. Place coating manufacturer's mechanical protection film over field coated weld area, overlapping onto pipe coating, at a minimum of 6 inches. Follow Section 02510.

3.2 BOLTED WIRE CONNECTIONS

A. Bolted wire connections for bonding purposes are permitted to bolts on the valve body following Standard Details and as specified herein.

B. Connect wire to bolt on valve body that is closest to pipe centerline.
1. After the valve bolt is removed, clean the valve surface under bolt head to bright metal.

C. Use prefabricated bar lug on bonding wire end that will connect to valve bolt.
1. Size bar lughole to fit valve bolt, and make bolted connection following Standard Details.
2. After bolted wire connection is completed, test joint bond wires for electrical continuity.
3. After bond wire passes electrical continuity test, coat bar lug, exposed copper wire and exposed valve metal with minimum 1/4 inch of petrolatum or petroleum wax mastic.

3.3 JOINT BONDING OF PIPE

A. Bond pipe joints and fittings to form electrically continuous pipeline following Drawings and Standard Details.

B. Wire.
   1. Joint bonding wire: Sized according to pipe diameter and following Standard Details.
   2. Cut bond wire to shortest length practicable, including some slack, for given span.
      a. Locate bond wire welds on pipe and fittings following Standard Details.
      b. Horizontal welds are preferable, but where there is insufficient space on a fitting, vertical welds will be permitted.
      c. Where multiple parallel bond wires are involved, space wires neatly and without wires crossing each other.
   3. Do not splice bond wires.
      a. Replace bond wires broken during construction.
      b. Reweld loose weld connections.
   4. If insulation of bond wire is damaged between welds, repair insulation:
      a. Thoroughly clean the damaged area and 6 inches on either side of it.
      b. Wrap minimum of one overlapping layer of rubberized electrical tape around damaged area and extend at least 2 inches on each side.
      c. Wrap two overlapping layers of plastic electrical tape around rubberized tape and extend at least 1 inch beyond rubberized tape at each end.

3.4 ANODE INSTALLATION

A. Prepackaged magnesium and zinc anodes: Installed where indicated on Drawings.
   1. Before installation, remove all shipping covers from anode (the prepackaged cotton bag or cardboard box for magnesium and zinc anodes shall not be removed).
   2. Do not lift anode by lead wire.
   3. Protect cloth sack or cardboard box with prepackaged backfill surrounding anode from tearing or damage. If damage occurs, provide new prepackaged anode.
   4. Install anodes in existing soils (free from rocks, roots, organic material, trash or other debris) and backfill with minimum of 6 inches of existing soil. Do not install anode in sand, rock, or gravel backfill.
   5. Provide minimum anode spacing of 2 feet from other pipelines.
   6. Pre-soak anode with 5 gallons of water after placement, but before backfilling, unless groundwater covers it.

B. Anode Lead wires.
   1. At test stations with anodes:
      a. Install anode lead wires minimum 2 feet below grade. Handle wire with care.
      b. Connect anode lead wire to terminal board at test station, as shown on Drawings and Details, using proper sized crimp type connectors on wire ends. Anode lead wire shall be of sufficient length to reach test station terminal board without splicing and with 18 inches of slack.
      c. At the time of installation, do not connect anode lead to pipe lead so testing can be conducted as specified under Post Installation Corrosion Control Testing.

2. Anodes on header cables:
    a. Connect anode lead wires to header cable as shown on Drawings and Details, using the specified connectors and splice protection.
    b. Connect anode header cable to terminal block at test station, as shown on Drawings using proper sized crimp type connectors on wire ends. Anode header cable shall be of sufficient length to reach test station terminal board without splicing and with 18 inches of slack.
    c. At the time of installation, do not connect anode lead to pipe lead, so system testing can be conducted as specified under Post-Installation Corrosion Control Testing.

3.5 INSTALLATION OF TEST STATIONS

A. Location of Test Stations:
1. Follow Drawings and Standard Details.
    a. Locate surface of concrete pad at finish grade, unless otherwise directed by the **County**.
    b. Locate directly over pipeline except in areas that would place the test station in a roadway.
    c. Locate these test stations to closest point just off the edge of the road or curb.
2. Identify test station with number following Drawings or **County**-furnished number.
    a. Paint the number legibly inside test box lid or cover and on terminal block.
    b. Use permanent and weatherproof paint for metal or plastic surfaces.
3. Immediately after installation in areas to be improved, protect and identify test station locations with three stakes extending at least 4 feet above existing grade, equally spaced around test station and wrapped with orange fluorescent flagging material within 6 inches from the top of stakes.
4. Situate pipe for pipe mounted test stations directly over pipeline. If this is not possible, locate at the **County's** direction.

B. Test Lead Wires:
1. Install test lead wires without splices as shown on Standard Details and attach to pipe using exothermic welding method. Test lead shall be of a sufficient length to reach the test station terminal board without splicing and with 18 inches of slack.
2. Locate wires on top and along pipe and at right angles to pipeline when wires depart for offset test stations.
    a. Test station wires: Routed minimum of 2 feet below finished grade.
    b. Test lead wires: Routed under roadway to the test station through conduit, as necessary.
    c. Protect wires from damage during backfilling operations with adequate slack and support.
3. Place continuous yellow detectable warning tape directly over test lead wires, 12 inches to 18 inches below finished grade.
4. Terminate test lead wires inside test box using proper sized crimp-type connectors on wire ends.
    a. Connect each wire to terminal, maintaining at least 18 inches slack in each wire at the test station. Do not combine wires on a terminal except as necessary for anode connections.
    b. Neatly coil slack wire in test station below terminal board.

5. Test each lead wire for continuity after backfill is completed.
    a. If test for continuity fails, repair or replace at the **County's** direction.

C. Reference Cells: Follow Standard Details or Drawings.
1. Use native trench material to backfill the reference electrode.
2. Before installation, remove the plastic shipping cover from the reference electrode.
3. Cloth bag containing the special backfill shall remain intact.
4. Protect cloth bag from tearing or damage.
5. If damage occurs, provide new prepackaged reference cell.
6. Reference cell lead wire: Sufficient length to reach test station terminal board without splicing and with 18 inches of slack.
7. Test lead wire from reference cell for proper function.
    a. If reference cell is not functioning properly, repair or replace.
    b. After reference cell is functioning properly, connect lead wire from reference cell to terminal block at test station.
    c. Do not attach other test lead wires to terminal that is used for reference cell.

D. IR Drop Lead Wires:
1. Locate IR drop test stations following Drawings.
2. Wire size, type, and length: Following Standard Details.
3. Place long lead wires below springline of pipe and taped to pipe for protection, following Drawings.
4. Lead wires: Sufficient length to reach test station terminal board without splicing and with 18 inches of slack.

E. Shunts: Install shunts in test stations with anodes following Drawings.

Foreign Pipeline: Provide test stations at foreign pipelines following Drawings and Standard Details.

F. Notify the owner of foreign pipeline at least 2 weeks before test station construction. Unless otherwise indicated, only the foreign pipeline owner or an approved representative will be permitted to weld wires to foreign pipeline.

3.6 CLEARANCE TO OTHER STRUCTURES

A. Maintain a 1-foot clearance to other structures, where possible.
1. When 1 foot cannot be maintained, install flexible polyethylene mesh webbing pad around the new piping and secure with non-metallic tape.

3.7 INSULATING JOINTS

A. Install following Standard Details and Drawings.

B. Test each insulator for electrical insulation before backfilling. Provide the **County** a minimum of 1 week notice prior to testing.
1. If insulator is not properly isolated, repair or replace all defective components at no additional cost to the **County**.

2. Test the repaired insulator.
3. Continue this process until the insulator is tested to be properly isolated.
4. Insulation that passes for effective isolation during the pre-backfill test, but does not render positive isolation results during acceptance testing shall be repaired by the **Contractor** at no additional cost to the **County**.

C. Coat entire joint including bolt ends and nuts with coating material specified herein. Fully coat to a minimum of 12 inches on each side of flange.
1. Clean surface of flange and components and prepare surface following manufacturer's recommendations.
2. Apply a uniform coat of primer to flange and all components.
3. Apply filler mastic to all irregular surfaces of flange to provide smooth profile for tape application.
4. Apply innerwrap to flange and all components in spiral fashion: minimum overlap of 55 percent.
5. Apply outerwrap to flange and all components in spiral fashion: minimum overlap of 1 inch with sufficient tension to provide continuous adhesion of tape.

D. For copper house connections and other small pipe, install connection insulator following Drawings. Locate insulator at copper pipe tie-in following Standard Details.

3.8 CONCRETE BUTTRESSES, SUPPORT BLOCKS, ANCHOR BLOCKS, AND OTHER CONCRETE STRUCTURES

A. Position reinforcing steel used in construction of support blocks, anchor blocks, and other concrete structures so it is not in contact with piping.
1. Maintain minimum of 2-inch clearance between piping and reinforcement steel or other metallic components.
2. Under no circumstances shall metallic pipe be in contact with reinforcing steel.

3.9 INSULATED CASING SPACERS AND CASING END SEALS

A. Each length of pipe within casing: Supported and electrically isolated from casing by the use of insulating spacers (supports).
1. The number of casing spacers and spacing between them shall follow the recommendations of the casing spacer manufacturer. A minimum of three (one at each end and one at the midpoint of the pipe) are required to support each section of pipe.
2. Insulating spacers: These shall be of sufficient dimension to center carrier pipe within the casing and to serve as runners to slide carrier through the casing.

B. After carrier pipe is installed within the casing, test electrical isolation between the casing and carrier pipe. Provide the **County** with a minimum 1-week notice prior to completion of the installation of piping within casing.
1. If carrier pipe is not electrically isolated from the casing, remove carrier pipe from the casing, replace any and all defective or damaged casing spacers and reinstall carrier pipe in the casing at no additional cost to the **County**.
2. Retest the repaired electrical isolation.
3. Continue this process until the casing is tested to be electrically isolated from carrier pipe.

4. Pipe to casing insulation that passes for effective isolation during the pre-backfill test, but does not render positive isolation results during acceptance testing shall be repaired by the **Contractor** at no additional cost to the **County**.

After casing isolation has been confirmed as effective, install casing end seals at both ends of casing. Casing end seals shall be installed following written instructions of the end seal manufacturer.

3.10 PLACING SYSTEM IN SERVICE

A. Accomplish final connections and place Cathodic Protection System in service as specified under Post Installation Corrosion Control Testing.

3.11 POST-INSTALLATION CORROSION CONTROL TESTING

A. Acceptance criteria for effective cathodic protection: Following NACE International SP0169, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems." Use one or a combination of the following:
   1. Negative voltage of at least 0.85 volt with cathodic protection applied.
      a. This potential is measured with respect to a saturated copper-copper sulfate reference electrode contacting the electrolyte, using both permanently installed and portable reference electrodes.
      b. Voltage drops other than those across the structure-to-electrolyte boundary shall be considered for valid interpretation of this voltage measurement, or
   2. Negative polarized potential of at least 0.85 volt relative to a saturated copper sulfate reference electrode, or
   3. A minimum of 100 mV of cathodic polarization between the structure surface and a stable reference electrode contacting the electrolyte. The formation or decay of polarization can be measured to satisfy this criterion.

B. All testing shall be witnessed by the **County**. The **Contractor** shall provide the **County** a minimum of 1 week notice prior to conducting any testing.

C. Record methods and instruments used to perform required tests including all readings, measurements, and calculated resistances.

D. Minimum Equipment to Perform Corrosion Control Testing:
   1. DC ammeter with full scale ranges of 1, 10, and 100 amperes, accurate to within 1 percent of full scale. A millivolt meter with 1 percent of full-scale accuracy and shunts may also be used.
   2. Voltmeter with minimum input resistance of 10 megohms, with DC low range of 200 millivolts full scale to DC high range of 100 volts full scale and accurate to within 1 percent of full scale.
   3. An alternative to 1 and 2 above, may be high impedance multi-combination voltmeter-ammeter used with 100 ampere shunt, Miller B-3D, B3-A2, M-3-A2, or equal.
   4. DC power supply with steady capacity of 50 amperes minimum, produced from portable cathodic protection rectifier, 6- or 12-volt automotive type wet cell batteries, or equal.

5. Test leads and clamps suitable for carrying test current, rated up to 75 amperes with lead wire length.
6. Multiple wire reels with appropriately gauged wire for carrying out the required tests.
7. Adjustable resistors with sizes and capacities to handle desired outputs.
8. Safety switch rated for test current.
9. One pair of electrical probes for voltmeter.
10. Saturated copper-copper sulfate reference cell(s).
11. Gas Electronics Model 601 and 702 insulator testers.
12. For close interval pipe-to-soil potential surveys, utilize the following:
    a. American Innovations Allegro Data Logger, or approved substitution
    b. Footage chainer/counter

E. Continuity Testing:
1. Submit records of joint bond resistance testing including:
    a. Instruments and equipment used, with sketch of test connections.
    b. Test amperages, voltages, and voltage changes during testing.
    c. Joint resistance, measured and calculated.
    d. Location of each test station, giving pipe station and street address, and GPS coordinates.
2. Measure joint bond resistances:
    a. Conduct longitudinal pipe resistance measurements between consecutive test stations.
        1) Measured by impressing a DC test current between pipe test lead wires at consecutive test stations.
        2) Simultaneously measure DC voltage between pipe test lead wires at the same consecutive test stations while impressing the DC current.
    b. Calculate the resulting span resistance and submit to the **County** for review and acceptance.
        1) Submit all calculations and data in their entirety.
        2) Provide GPS coordinates for each test station.
3. Calculate theoretical joint and bond resistances:
    a. Measure distance between test stations.
    b. Using Calculated Resistance Table herein at end of Section, multiply measured distance by Resistance per Foot (ohms) from table to obtain theoretical (or calculated) resistance of pipe and multiply number of bonded pipe joints by the theoretical resistance of a joint bond.
    c. Acceptable resistance: Measured resistance shall not exceed 15 percent of calculated resistance.

F. Insulator Testing (Insulated Flanges, and Insulated Casing Spacers):
1. After assembly and prior to backfilling, test each insulating joint for insulation using methods generally accepted in corrosion control engineering.
    a. Repair or replace defective or ineffective insulating joint.
2. Submit records of insulated joint testing including:
    a. Test method and instruments used, with sketch of test connections.
    b. Location of insulated joint, giving pipe station and street address, and GPS coordinates.
    c. Instrument readings of current, voltage, and calculated resistance.

3. Acceptance criteria:
    a. High frequency isolation tester: "Acceptable," "Satisfactory," or other similar direct meter reading, and
    b. Electrical potential/applied current: Static potential difference across insulator of no less than 0.1 volt before application of test current; a positive potential shift on the side of the insulator where current is applied, and a negative potential shift on the side of the insulator opposite of where current is applied.

G. Test Station Lead Wire Testing:
1. Test each wire with a high impedance (minimum 10 megohms) DC voltmeter and copper-copper sulfate reference electrode. Testing shall include the permanent reference electrodes, anodes, and all pipe test lead wires. Testing shall be conducted before anode header cable is connected to the shunt terminal.
2. Acceptance criteria:
    a. Ductile iron shall be between 0.50 to 0.65 volt to a copper-copper sulfate ($Cu/CuSO_4$) reference electrode.
    b. Zinc anodes shall be between 1.00 and 1.10 volts to $Cu/CuSO_4$.
    c. The permanent copper-copper sulfate reference electrode shall be between 0.05 and +0.05 volt to a portable copper-copper sulfate.
    d. Record all data (with GPS coordinates) and include in the final acceptance test report.

H. After Backfill is Completed and Test Stations are in Place:
1. Test and verify continuity and electrical isolation of pipeline.
2. Measure pipe-to-soil potentials in close interval over-the-line survey, continuously at electrode spacing not to exceed 2.5 feet.
3. Relate contact points of reference electrodes to pipeline stations and known pipeline appurtenances, including test stations.
4. Prepare as-built sketch of each test station terminal board and test lead wire hookups.
5. Prepare new Test Station Card
    a. Use GPS coordinates: Maryland State Plane Coordinates. Horizontal Control-MD State Plane Coordinates NAD83/91 to 0.01-foot accuracy, Vertical Control--NGVD29 to 0.01 foot accuracy.
    b. Use only the format shown at the end of this Specification Section.
        1) If submitted in any other format, it will be rejected.
        2) An aerial map of the location is prohibited.
6. Submit as-built sketches in hard copy and electronically in AutoCAD format.

I. Corrosion Control Testing Sequence.
1. Before anode connection:
    a. Close interval pipe-to-soil potential survey (see below).
    b. Pipe-to-soil potential at each test station.
    c. Reference cell-to-pipe potential at each test station.
    d. IR drop calculations (K factor).
    e. IR drop measurements - current flow and direction.
    f. Anode potential.
2. At time of anode connection:

a. Connect anodes to an appropriate test lead wire and shunt in each test station.
b. Pipe-to-soil potential at each test station.
c. Reference-to-pipe potential at each test station.
d. IR drop measurements - current flow and direction.
e. Anode current and potential output.

3. Three to 4 weeks following anode connection (i.e., cathodic protection system activation):
   a. Close interval pipe-to-soil potential survey (see below).
   b. Pipe-to-soil potential at each test station.
   c. Reference cell-to-pipe potential at each test station.
   d. IR drop measurements - current flow and direction.
   e. Anode current and potential output.
4. Close Interval Pipe-to-Soil Potential Surveys
   a. As noted above, over-the-line “on” and “off” close interval potential surveys with 2.5-foot spacing shall be performed.
      1) Close interval survey data shall be submitted in graphic and tabular format.
      2) Graphs:
         a) Show no more than 500 feet of pipe per 8.5-inch by 11-inch page
         b) Features for identifying data points: Provided on graphs and tables.
         c) Fill the entire page and scaled so it clearly show potential variations.
      3) Only computer generated graphs and tables shall be acceptable.
      4) This testing shall be performed with the following equipment:
         a) American Innovations Allegro Data Logger with companion software, or approved equal.
         b) Copper-copper sulfate reference cell(s).
         c) Footage chainer/counter.

J. Final Acceptance Test Report:
1. Include all final test data tabulated in computer generated format.
   a. Description of all test procedures.
   b. Legible sketches with GPS coordinates of test station locations.
   c. Test station as-built tie-down sketches in AutoCAD format.
   d. Conclusions as to the condition and the operating status and effectiveness of the cathodic protection system.
2. Provide certification that cathodic protection system is functioning following NACE SP0169.
   a. **Contractor's** NACE-certified corrosion control engineer or technician shall sign the Final Acceptance Test Report and include his/her NACE certificate number with his/her signature.

3.12 Defective or Improperly Installed Components.

A. The repair or replacement of any defective or improperly installed component of the cathodic protection system or corrosion monitoring facility shall be the sole

responsibility of the **Contractor**. Any and all repairs or replacement of defective or improperly installed corrosion control components shall be performed by the **Contractor** at no additional cost to the **County**.

PART 4 MEASUREMENT AND PAYMENT

4.1 TEST STATIONS

A. Measurement: By each complete in place.

B. Payment: At unit price for each as listed in Bid Schedule.
   1. Payment includes provisions to provide test stations, including but not limited to, joint bonding, insulating joints, lead wires, anodes, and other necessary components to complete the corrosion control system.

CALCULATED RESISTANCE TABLE

DUCTILE IRON PIPE

Diameter in Inches	Class	Resistance Per Foot (OHM)
4	51	0.0000762
4	52	0.0000688
4	53	0.0000628
4	54	0.0000578
4	55	0.0000536
4	56	0.0000500
6	51	0.0000486
6	52	0.0000441
6	53	0.0000404
6	54	0.0000373
6	55	0.0000346
6	56	0.0000323
8	50	0.0000380
8	51	0.0000343
8	52	0.0000313
8	53	0.0000288
8	54	0.0000266
8	55	0.0000248
8	56	0.0000233
10	50	0.0000287
10	51	0.0000261
10	52	0.0000239
10	53	0.0000221
10	54	0.0000205
10	55	0.0000192
10	56	0.0000180
12	50	0.0000225
12	51	0.0000206
12	52	0.0000190
12	53	0.0000176
12	54	0.0000164
12	55	0.0000154
12	56	0.0000145
14	50	0.0000182
14	51	0.0000167
14	52	0.0000155

CALCULATED RESISTANCE TABLE

DUCTILE IRON PIPE

Diameter in Inches	Class	Resistance Per Foot (OHM)
14	53	0.0000144
14	54	0.0000135
14	55	0.0000127
14	56	0.0000119
16	50	0.0000155
16	51	0.0000143
16	52	0.0000132

16	53	0.0000123
16	54	0.0000115
16	55	0.0000109
16	56	0.0000103
20	50	0.0000118
20	51	0.0000109
20	52	0.0000101
20	53	0.0000095
20	54	0.0000089
20	55	0.0000084
20	56	0.0000079
24	50	0.0000093
24	51	0.0000087
24	52	0.0000081
24	53	0.0000076
24	54	0.0000071
24	55	0.0000067
24	56	0.0000064
30	50	0.0000073
30	51	0.0000066
30	52	0.0000061
30	53	0.0000056
30	54	0.0000052
30	55	0.0000049
30	56	0.0000046
36	50	0.0000055
36	51	0.0000050
36	52	0.0000045
36	53	0.0000041
36	54	0.0000038
36	55	0.0000035
36	56	0.0000033

CALCULATED RESISTANCE TABLE

DUCTILE IRON PIPE

Diameter in Inches	Class	Resistance Per Foot (OHM)
42	50	0.0000043
42	51	0.0000039
42	52	0.0000035
42	53	0.0000032
42	54	0.0000029
42	55	0.0000027
42	56	0.0000025
48	50	0.0000035
48	51	0.0000031
48	52	0.0000028
48	53	0.0000025
48	54	0.0000023
48	55	0.0000021

48	56	0.0000019
54	50	0.0000028
54	51	0.0000025
54	52	0.0000022
54	53	0.0000020
54	54	0.0000018
54	55	0.0000017
54	56	0.0000015

Joint Bond Wire Resistances

#2AWG Wire	0.000162 OHM Per Foot
#4AWG Wire	0.000259 OHM Per Foot

TEST STATION LOCATION CARD

TEST STATION LOCATION CARD

LOCALITY:

COUNTY:

TS-

ORIGINAL
TS NO.:

TEST STATION
TYPE:

TEST STATION TIES

State of Maryland - State Plane Coordinate System
GPS accuracy to sub-meter

N _____ E _____

DRAWN BY:

DATE DRAWN:

DATE FILMED:

1" = 50'

CHECKED BY:

GRID:

200' SHEET
NUMBER:

CONTRACT
NUMBER:

LOCATION SKETCH

Scale 1"=50'

(do not use any kind of aerial mapping)