

EXHIBIT 1

TECHNICAL SPECIFICATIONS

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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 plants, tools, equipment, materials, supplies, and manufactured articles and furnishing labor, transportation, and services, including fuel, power, water, and essential communications, and performing work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The Work shall be complete, and any work, materials, and services not expressly indicated or called for in the Contract Documents that 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. This project consists of furnishing and installing all materials and products in the Scott Boulevard Phase II Water Main Replacement project. Components included in Phase II are; approximately 9,140 linear feet of 30"- diameter ductile iron water transmission main, 60 linear feet of 20" diameter, 10,660 linear feet of 12" diameter, 1,440 linear feet of 8" diameter and 1,240 linear feet of 6" diameter water distribution mains.
- C. 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/ground water, 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

The Work is required at the locations shown on the Approved Drawings.

1.03 WORK COVERED BY THE CONTRACT DOCUMENTS

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 Metropolitan Atlanta Rapid Transit Authority, CSX Railroad, public utilities and the 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 coordinate the Work with owners of private and public property where access is required for the performance of the Work.

1.05 CONDITIONS AT THE SITES

- A. The **Contractor** shall make necessary investigations to determine the existence and location of underground utilities.
- B. The **Contractor** shall be responsible for damage to and for maintenance and protection of existing utilities, structures, and personal property.
- C. These Contract Documents do not guarantee 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. The **Contractor** is responsible for safety at no additional cost to the **County**.
- E. The **Contractor** shall report hazardous conditions to the **County**.

+++ END OF SECTION 01001 +++

SECTION 01010 PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

Section includes:

- A. Lands and Rights-of-Way/Easements, and Permits
- B. Access to and **Contractor's** use of the site
- C. Coordination requirements
- D. Construction procedures

1.02 LANDS AND RIGHTS-OF-WAY: EASEMENTS AND PERMITS

- 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. Additional permitting and easements required shall be obtained by the **Contractor** and the **Contractor** shall 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** shall 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 to cause the least interference with the **County's** operations.
- C. 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 the **County** approves. Occupied areas include 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 that 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 Work is required.

D. Utilities Notification Prior to Construction:

1. Georgia law mandates that, before beginning mechanical digging or excavation work, **Contractor** shall contact Georgia 811 by using eRequest on www.Georgia811.com or by calling 811 or 1-800-282-7411.
2. **Contractor** may utilize EDEN (Excavation Digging Event Notification) web application that enables Members and Professional Excavators to create, manage, respond to, and edit Georgia 811 Locate Request Tickets.

3. **Contractor** shall retain records of notification and responses during the course of the project until final Payment.

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 type modifications required.
4. Before starting work that might affect existing construction, verify the existence and location of underground utilities and other underground construction.
5. Prepare preconstruction photographic documentation in conformance with the requirements of Section 01380 of these specifications.

B. General Preparation Requirements:

1. The **Contractor** shall obtain, maintain, and pay for required permits.
2. The **Contractor** shall take field measurements as required to properly conduct the work.

C. Cleaning and Protection: 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 any 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:

1. Requirements for the **Contractor** achieving Substantial Completion are defined in the Contract Documents in GR-1 of the General Requirements.
2. Substantial Completion is typically defined to include:
 - a. Completion of Work required by the Contract Documents
 - b. Operation of components and systems of the Work, including acceptance of testing and startup requirements
 - c. Closeout of quality deficiencies and non-conformances
 - d. Delivery and acceptance of spare parts, operations manuals, and vendor documentation

- e. Completion of vendor training
 - f. Completion and delivery of “red-line” as built drawings
2. When the **Contractor** believes substantial completion has been achieved, **Contractor** shall notify the **County** in writing, requesting Substantial Completion. The **County** will verify that the contractual documentation requirements for Substantial Completion have been completed, including closeout of open NCRs. If verified, the **County** will schedule a Substantial Completion inspection and walk-through with the **Contractor**, DWM Operations, and the Designer, or will notify the **Contractor** in writing of acceptance or the reason(s) for denying Substantial Completion.

F. Final Completion:

- 1. Requirements for the **Contractor** achieving Final Completion are defined in the Contract Documents in GR-9 of the General Requirements.
- 2. After Substantial Completion, **Contractor** shall meet additional requirements for Final Completion and release of final payment. These requirements will be defined in the Contract and typically include:
 - a. Completion of punch list items by the **Contractor**
 - b. Demobilization from the project site
 - c. Submittal of warranties
 - d. Release of subcontractor or vendor liens
 - e. Turnover of remaining project documents required by the Contract, including final as-built drawings by the Design Consultant

3.02 CHANGE MANAGEMENT

A. Contract Change Process

Any firm under contract with the **County** may submit a Change Request (CR) to the **County** following the requirements of the contract. A CR may address requested changes in cost and/or schedule, as well as contract terms or scope that do not result in cost or schedule impacts.

Changes may also be initiated by the **County** in the form of a Field Order (FO). The **Contractor** shall proceed with the change unless they believe the FO entitles them to a change in contract price, time, and/or term. If so, the **Contractor** shall submit a CR within 15 days of receiving the FO.

The CR from the **Contractor** is to be accompanied by a detailed proposal describing the **Contractor's** opinion of the CR's cost, schedule, and/or contract term impacts.

If the CR is acceptable to the **County**, the **Contractor** will be directed to submit a CO to the **County** to process. If the CR is not acceptable to the **County** then the **Contractor** may negotiate the CR. If the cost and/or schedule impacts cannot be agreed, then the **County** will either instruct the **Contractor** to proceed with the change using a Unilateral Change Directive (UCD), if the change is deemed by the **County** to be needed, or the change can be terminated if the change is deemed to be not needed. If the **County** issues

a UCD after failing to agree on the price of a CO, then the pricing of the change is per the contract terms.

A UCD can be initiated by the **County** only when there is an imminent threat to public safety or health, or a potential shutdown of a vital **County** function.

B. Amendment to the Contract

If the approval of a CO requires a written, formal amendment to the contract, the **County** will process the formal amendment.

C. Project Scope Change Impacts

A change to a Design /Build contract may materially change the scope of the project, including greater impact on the construction scope than the design scope. A design scope change may also materially impact the project configuration even if it is a no-cost change. Additionally, a change to one project's scope may have impacts to another project's scope.

So that a CO is not approved without understanding its full impacts beyond the affected contract scope, project scope change impacts shall be approved by the **County**. These must consider changes through every phase of the project, and/or impacts to other projects.

D. Baseline

If a CO is approved, the **Contractor** will prepare a Project Baseline Change Instruction Form to formally change the project scope, baseline schedule, and baseline budget.

E. Change Monitoring

The **Contractor** is responsible for monitoring changes to the contract. The **Contractor** will maintain a Design Change Log for each project, and will maintain a Construction Change Log that includes the change description, change status, category of change, contract, estimate of cost, estimate of schedule impact, and current process step. Change logs are updated each month and included with the Project Progress Report.

Responding to and processing changes in a timely manner is a priority. Change backlogs will be vigorously monitored and managed. Change status reports will be developed by the **Contractor** from the Change Logs to provide current status of each open change, which process step is active, and how many days remain in the process step. "Overdue" reports will be elevated to the **County** for follow-up and closure.

F. Change Status

Changes will be identified by one of the four following status descriptions:
Proposed Change is a change that has been submitted as a CR or FO, but has not yet been negotiated. Proposed changes require closure if they are deemed to be not required, or must be resolved in a timely manner if they are deemed required. The cost estimate

and/or schedule impact of a proposed change will usually change as it goes through the contract change process. These changes must be reflected in the Change Log as they occur and included in monthly cost and schedule forecasts.

Pending Change is a change that has been negotiated, but has not yet received final **County** approval. These changes must be included in monthly cost and schedule forecasts.

Approved Change is a change that has received final **County** approval. The contract scope, budget, and/or schedule will be amended to include approved changes. Approved changes will be included in monthly cost and schedule forecasts until a formal re-baselining of the project schedule and/or budget is approved.

Closed Change is a change that has been formally rejected and closed by the **County**, or withdrawn by the originator.

G. Category of Change

Changes will be categorized as follows to track the types of changes that occur over the life of the project:

- **County Requests:** any change initiated by the **County**.
- **Differing Site Conditions:** new information not reasonably available during design, or considered “unforeseeable” through due diligence on the part of the **Contractor**.
- **Design Errors:** changes due to errors or deficiencies in the design.
- **Design Omissions:** items omitted from the design that would have been included in the original bid, had they been known.
- **Regulatory Requirements:** changes mandated by regulatory agencies that are different from approved permit conditions at the time the contract was approved.
- **Other:** changes required for all other reasons, including emergency work, adjustment of bid quantities, force majeure events, incentive payments, accepted substitutions, and changes identified during value engineering.

3.03 HEALTH AND SAFETY CONSIDERATIONS

- A. Take precautions to prevent fires and to facilitate firefighting 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 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 from this Work.
- F. Provide adequate traffic control in accordance with current MUTCD standards and the approved traffic permit.
- G. When using trenches/excavations, follow OSHA standards 29 CFR 1926.650, 29CFR 1926.651, and 29 CFR 1926.652.

3.04 ENVIRONMENTAL PROTECTION

A. General

Contractor shall conduct its operation in a manner to prevent pollution of the environment surrounding the area of work and shall be responsible for furnishing necessary items for fulfilling the work described herein.

B. Material Transport

Contractor shall comply with the Official Code **County** of DeKalb 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, providing a suitable vehicle inspection and cleaning installation with permanent crew, and the removal of material spilled in public areas at no additional cost to the local government agency.

C. Waste Materials

No waste or erosion materials shall 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 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 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 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.

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-weighting 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 thru 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 thru Saturday, except legal holidays - At times other than those noted above	70 dBA 60 dBA
Night work from 10 p.m. until 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

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

H. Bypassing During Construction

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

I. Responsibility for Spills and Accidental Discharges

In the event the **Contractor** causes or has a spill or accidental discharge for

which the **County** is fined by the State of Georgia Department of Natural Resources Environmental Protection Division (EPD), the **Contractor** agrees to remediate the spill or discharge immediately in accordance with current EPD regulations and to pay fines assessed against the **County** and/or **Contractor**, and pay for the **County's** cost associated with efforts to remediate the situation. The **County** shall be notified immediately of such an event.

3.05 PROTECTION OF THE WORK

- A. Conduct construction operations so 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 as designed by a Registered Professional Engineer in the state of Georgia at the **Contractor's** cost.
- E. Equipment and vehicles used on DWM 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 two inches in height. Markings shall be in place upon initiation of the work on the project site.
- F. A copy of the Project Notice to Proceed letter issued by the **County** shall be available 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 2 weeks of removal. The required permanent pavement replacement for public roadways shall be performed within 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 always maintain copies of permits and approved plans on the project site.

3.06 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 and to provide proper advance notification (a minimum of 48 hours) to the affected customers.

Due to the nature of businesses and traffic in certain projects' areas, water outages for connections, service changeovers, and other Work may not be allowed during normal work hours. The **Contractor** shall factor these considerations into 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 01011 UNIQUE REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. This Section conveys to the **Contractor** unique and unusual stipulations and requirements established for this Project. Some of the stipulations and requirements are a result of negotiations with various entities and organizations, which have an interest in this Project. Some requirements are based on technical aspects of the Project, which are not otherwise conveyed to the **Contractor**. The provisions of this Section shall supersede the provisions of the Division 1 through 17 Specifications, but shall not supersede the Bidding Requirements, Contract Forms, or Conditions of the Contract.
- B. If Owner Controlled Insurance Program (OCIP) is implemented in the contract, then OCIP shall govern as follows: In connection with the Work, and for the **Contractor** and those subcontractors deemed eligible by the **County** for participation, the **County** shall implement an OCIP, providing certain insurance coverages as detailed herein. The insurance coverages provided by the OCIP apply only to the Work performed on the Project site. The **Contractor** and its subcontractors shall provide their own insurance for off-site activities. The Builder's Risk/All Risk Property Insurance component of the OCIP shall expressly exclude coverage on **Contractor's** and subcontractors' machinery, tools, and equipment not destined to become a part of the Project Work.

1.02 EXISTING FACILITY OPERATIONS

- A. The existing facilities shall remain in operation while the new construction is in progress.
- B. The **Contractor** shall coordinate the Work with the **County** so that the construction shall not restrain or hinder the operation of the existing facilities.
- C. After having coordinated the Work with the **County**, the **Contractor** shall prepare a submittal in accordance with Specification Section 01014 and 01300 to include the time, time limits, and methods of each connection or alteration and have the approval of the **County** before Work is undertaken on the connections or alterations.

1.03 SEQUENCING

- A. General: The **Contractor** shall be solely responsible for all construction sequencing.
- B. Notify the **County** at least 48 hours prior to relocating piping or diverting flows.
- C. Sequence Submittal:

1. The **Contractor** shall submit to the **County** for review a proposed sequence with appropriate times of starting and completion of tasks.
 2. The **Contractor** may propose alternatives to the sequencing constraints shown in this Section in an attempt to reduce the disruption of the operation of the existing facility or streamline the tasks of this Contract. The **County** is not obligated to accept these alternatives.
- D. Parking for **Contractor** personnel shall be fully contained within the site boundaries. No parking is permitted on public roads or on streets within the neighborhood. If necessary, the **Contractor** shall make arrangements for remote parking for its personnel, at no additional cost to the **County**.
- E. **Contractor** is advised there are numerous pressurized pipes, energized conduits and duct banks, overhead utilities, and gravity flow systems on the site. The **Contractor** shall be responsible for protecting the existing utility lines and shall be responsible for the repair, damages and all cost resulting from construction activities to these systems. In addition to these requirements, the **Contractor** is required to verify the actual locations of various buried lines shown in the Drawings by carefully excavated test pits and other direct means before starting Work in given areas at no additional cost to the **County**. Special care shall be taken during excavation to mitigate damage potential from previously unknown and active systems. Overhead utilities may require raising or relocation to access site.
- F. Unless shown otherwise on the Drawings, the **Contractor** shall restore the site to its original grade. Fill placed at the site to return it to its original grade shall be controlled fill, approved by the **County**. The site shall be grassed, strawed, and mowable. Final landscaping, including trees and shrubs, but not including grassing, shall be paid separately.
- G. The **Contractor** shall be responsible for maintaining and cleaning the Site Access Road from the date it occupies the Construction Site through the final completion of the construction period.
- H. **Contractor** shall grade site, relocate, set up, and connect utilities, including telephone and internet services for office facilities.

END OF SECTION 01011

SECTION 01014 WORK SEQUENCE

PART 1 - GENERAL

1.01 SCOPE

- A. Work under this Section includes construction sequencing and providing temporary facilities as necessary to operate the wastewater collection facilities and prevent wastewater bypasses during the Work. Work shall be scheduled and conducted by the **Contractor** so as to neither impede nor adversely affect any **County** or utility operations.
- B. The existing water transmission and distribution system is currently and continuously in operation. 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 water transmission and 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 before starting to relocate piping or taking existing components out of service.
- C. Penalties imposed on the **County** because of any bypass caused by the actions of the **Contractor**, its employees, or subcontractors, shall be borne in full by the **Contractor**. This includes legal fees, cleanup, remediation, and other **County** expenses resulting directly or indirectly from the bypass.

1.02 SUBMITTALS

- A. Outage Plan: In accordance with the General Conditions, the **Contractor** shall submit a detailed outage plan and schedule for any operations that necessitate removing a pipeline or structure from service. The schedule shall be coordinated with the construction schedule specified in this Section and shall meet the restrictions and conditions specified herein. The detailed plan shall describe the **Contractor's** method for maintaining operations and service, the length of time required to complete said operation, the affected facilities, and the equipment the **Contractor** shall provide.
- B. Sequence Submittal: The sequence provided in Part 3 of this Section is offered as a suggestion to the **Contractor**. The **Contractor** shall submit to the **County** for review and approval a proposed detailed sequence with appropriate times of starting and completion of tasks.
- C. Alternate Sequences: The **Contractor** may propose alternate sequences to those shown in Part 3 of this Section if they would reduce disruption of the existing facility's operation or streamline the tasks of this Contract.

1.03 QUALITY ASSURANCE

At least two weeks prior to any proposed activity that will require any portion of the water transmission and distribution system to be removed from operation, require bypassing, or interrupt flow, the **Contractor** shall schedule a meeting with DWM operating personnel to discuss the **Contractor's** detailed plan for the proposed operation. The plan shall meet the following minimum requirements:

- A. Plan shall be written in outline form and presented in a format that shows the progression of events in sequential and/or concurrent order of activity, along with the duration of each activity.
- B. The written plan shall be supplemented by understandable drawings, sketches, and details as required to show the logic of the plan.
- C. The plan shall delineate the responsibilities of the DWM operating personnel and the **Contractor**, to eliminate delays from conflicting viewpoints about responsibilities when the plan is implemented.
- D. After discussion of the plan at the meeting, any agreed changes 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** at least one week prior to commencement of activities. On the day prior to the commencement of activity, a brief meeting of involved parties shall convene to establish the starting time and initial activity of DWM operating personnel and **Contractor's** personnel.

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. The **Contractor** shall ascertain that existing facilities are protected and shall not be damaged as a result of this construction. No settlement of existing facilities shall be acceptable. All work shall be performed in a safe manner.

Unless otherwise permitted, no existing valves or equipment shall be operated by the **Contractor**.

3.02 PROPOSED CONSTRUCTION SEQUENCE

The project shall be constructed in five stages to allow continuous operation of the facilities. The five stages of construction shall generally be performed in sequence, with overlap as required to maintain service. The five stages are:

Stage 1 - Preparatory

Stage 2 - Bypass Facilities (if required)

Stage 3 - New Pipe, Structures, Valves, and Connections

Stage 4 - Modification to Existing Facilities

Stage 5 - Cleanup and Final Restoration

3.03 REQUIRED SEQUENCES

The following items define the sequence of certain construction steps that shall 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 others can perform their work in a timely manner. The construction schedule prepared by the **Contractor** shall take into account the intermediate requirements depicted on the sequence diagram. The **Contractor** shall bear the responsibility for Work delays that cause delay and damages to other contractors requiring connection to Work under this contract.

3.05 LIMITS OF CONSTRUCTION

Due to the need for other contractors to be performing work on the site, the **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, the **Contractor** 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, 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 allow both 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, permits, and other activities. 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

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 shall 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 01020

ALLOWANCES

PART 1 — GENERAL

1.01 SECTION INCLUDES

- A. This section includes administrative and procedural requirements governing allowances. This Contract includes one (1) Allowance(s) that may be used at the discretion of the **County**.

1.02 QUALIFICATIONS AND REQUIREMENTS

- A. Owner's allowance, if included in the Contract Documents, is for the sole use of the **County** for costs for additional related work.
- B. Selected materials, equipment, and installation can be included in Contract Documents by cash allowances.
 - 1. Allowances are established to defer selection or scope until more information is available.
 - 2. Other requirements will be issued by a Change Order.
- C. Procedures for submitting and handling Change Orders are included in General Conditions of these Contract Documents.
- D. The allowance does not include:
 - 1. Incidental labor required to assist the **County**.
 - 2. Costs for retesting on failure of previous tests and inspections, or failure of the Contractor to be ready
 - 3. Costs of services not required by Contract Documents.
- E. Any unused allowances will be returned to the **County** by deductive Change Order.

1.03 SCHEDULE OF ALLOWANCES

- A. Owner's Allowance:
 - 1. This item shall consist of miscellaneous work to be accomplished at the direction of the **County** including:
 - a. Items of work consistent with and related to the project not indicated in the Contract Documents,
 - 2. Work performed under this section:
 - a. Shall comply with the various sections of these specifications as appropriate to the specific items involved.

- b. Work shall be further described, by the **County**, in written form and/ or supplemental exhibits.
- c. No work will be allowed under this section without the prior written approval of the **County**.

1.04 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form of a submittal.
- B. Submit invoices or delivery slips to indicate quantities of materials delivered for use in fulfillment of each allowance.
- C. Submit any additional information required by the **County** deemed necessary to document the use of allowance monies.
- D. At Project Closeout, the unused amounts remaining in the various allowances will be credited back to the **County**.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01040 COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. The **Contractor** shall coordinate execution of the Work with subcontractors, other contractors working on related **County** projects, and the **County**, as required, to maintain operation of the existing facilities and satisfactory progress of the Work.
- B. Requirements of this Section shall be in addition to those stated in the General Requirements.
- C. The **County** requires a written explanation of the **Contractor's** plan for coordinating and accomplishing separate phases of the Work, supplemental to the details provided under Section 01310 - Construction Schedule.

1.02 EXISTING UTILITIES

- A. Consult with the **County** on a daily basis while the **Contractor** performs 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 to avoid adversely affecting system operations. Such revisions in the proposed work schedule shall be accomplished with no additional compensation to the **Contractor**.

END OF SECTION 01040

SECTION 01056

GPS DATA COLLECTION

PART 1 — GENERAL

1.01 SECTION INCLUDES

- A. The purpose of this work is to establish the position of asset points and new work in the distribution system using the Global Positioning System (GPS); establish the minimum quality of data; and, specify how the data will be delivered. The GPS position will be established for newly identified distribution system assets and corrected in the event of existing incorrectly mapped assets.
- B. GPS capture is required as described below.
 - 1. Horizontal position of all manholes and new work with an accuracy of $\pm$ one foot. This applies to all manholes that are on Right-of-Way and all manholes off Right-of-Way.
 - 2. When GPS capture cannot be achieved on manholes, vaults, valves, meters, or fire hydrants and new work, due to canopy or building interferences, the position will be obtained by conventional survey methods tied to the stated reference system at the mapping grade accuracy listed above.

1.02 SUBMITTALS

- A. The **Contractor** shall provide to the **County** in writing the following information prior to the set deadline, or at the indicated frequency, whichever is applicable.

Type of Submittal	Time/Frequency of Submittal
Electronic Data related to New Assets	Weekly
Electronic Data and revisions related to Existing Assets	Weekly

1.03 RELATED SECTIONS

- A. The Work of the following Sections apply to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of the Work.
 - 1. Not Used

1.04 EXPERIENCED WORKERS

- A. Supervisor of the field crews shall have received certified training in the equipment being used in this function and have a minimum of three years' experience in performing such work including safe working practices, etc. Crew Leaders/Field Supervisors obtaining GPS data shall have received certified training in the equipment being used in this function and

have a minimum of one-year experience in performing such work including safe working practices, etc.

- B. The **Contractor** shall provide the **County** with written documentation indicating all Crew Leaders/Field Supervisors responsible for obtaining GPS data have received certified training in the equipment being used and where required the requisite experience.
- C. The **Contractor** shall provide a detailed account of satisfactory GPS experience during the last three years. Those references shall include contact, agency, telephone number and address.

1.05 REFERENCE COORDINATE SYSTEM

- A. The horizontal (X&Y) position of points will be referenced to the Georgia State Plane West NAD-83 coordinate system.

1.06 PROVIDED BY COUNTY

- A. A map of each area of work will be provided by the **County** from the **County's** existing GIS map. The map will contain, when available, streets with names, aerial imagery, manholes, vaults, valves, meters, or fire hydrants with asset IDs and water lines with existing GIS information available.

1.07 CALIBRATION

- A. Calibration shall be carried out in accordance with the GPS equipment manufacturer's instructions. Additional calibrations may be required during the course of the working day for large fluctuations of temperature and/or humidity, also in accordance with the manufacturer's instructions and tolerances.

1.08 INTERFERENCE

- A. **Contractor** must obtain a GPS position of water point structures and new work regardless of the overhead conditions or other nearby obstructions interfering with satellite signals, at no additional cost. Coverage conditions will not allow all positions to be obtained by setting directly over the point to be obtained. **Contractor** may use rangefinders or conventional surveying methods to obtain the position of the point.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 GENERAL

- A. The **Contractor** shall furnish all labor, tools, materials, software and equipment necessary for capturing the position of all points specified.

3.02 PREPARATION

- A. Mission Planning: **Contractor** shall plan the collection of GPS data, using the appropriate

software, to optimize the accuracy and speed of data collection while minimizing the impact and interference on traffic and other activities.

3.03 DATA

- A. The inventory database deliverable(s) for newly discovered assets, new work or existing mapped assets with incorrect existing position shall be submitted as an ESRI shapefile or geodatabase with each feature type represented in a different feature class (manholes, mains, etc.). Each attribute for manholes, mains and new work are to be populated as provided in the attribute templates provided below, at minimum. The data must be in the correct datum capable to be integrated into **County's** ESRI ArcGIS system which is the **County's** standard GIS software.

Manholes, Vaults, or Meters **Attributes Template**

ID	Northing	Easting	Depth	Size	Material

Valves **Attributes Template**

ID	Northing	Easting	Valve Type	Size	No. of Turns	Left or Right	OpenYN

Fire Hydrants **Attributes Template**

ID	Northing	Easting	Size	No. of Nozzles	MFR Date

- B. Asset IDs for manholes, vaults, valves, meters, or fire hydrants are to be provided by DWM via the guidance in this Specification Section. Asset IDs for newly identified assets found by the **Contractor** not in the existing mapped system inventory or new work installed by the **Contractor** will be coordinated with the **County** and assigned and populated within the electronic GIS deliverable. Northing and easting coordinates shall be populated in system as notated in these Specifications. Manhole and new work depth shall be measured to the nearest 0.1 ft. Manhole and new work depth is to include extent from rim elevation directly above the outflow invert to bottom of outflow invert elevation. Size for vaults, valves, and meters shall reflect the pipe size connecting to it in inches. Size of manhole is the manhole diameter measured in inches. Manhole wall material (along with any apparent coating) shall be populated with numerical coding described as follows:

Text Code	Description
1	None
2	Precast
3	Brick
4	Block
5	Poured
6	Brick and Concrete
7	VCP
8	PVC
9	Stone and Mortar

Also, any asset ID information as indicated in the field and new work shall be recorded.

Water Mains Attributes Template

Main_ID	From_ID	To_ID	Diameter	Material

- C. Asset IDs for assets are to be provided by DWM via the guidance in this Specification Section. Asset IDs for newly identified assets found by the **Contractor** not in the existing mapped system inventory or new work installed by the **Contractor** will be coordinated with the **County** and assigned and populated within the electronic GIS deliverable. Upstream and downstream manhole depths (US MH Depth & DS MH Depth) shall be measured to the nearest 0.1 ft and include the extent from rim elevation directly above the outflow invert to the outflow invert elevation. Main diameters shall be measured in inches and rounded to the nearest inch. Sewer main material shall be populated with text coding described as follows;

Text Code	Description
VCP	Vitrified Clay Pipe
Truss	Truss
PVC	Polyvinyl Chloride Pipe
Concrete	Concrete Pipe
RCP	Reinforced Concrete Pipe
DIP	Ductile Iron Pipe
CIP	Cast Iron Pipe
CMP	Corrugated Metal Pipe
Tile	Tile
Brick	Brick

Water Main material shall be populated with text coding described as follows;

Text Code	Description
AC	Asbestos Cement
CI	Cast Iron Pipe
COP	Copper
CS	Carbon Steel
DI	Ductile Iron Pipe
GA	Galvanized Steel
PC	Precast Concrete
PVC	Polyvinyl Chloride Pipe

- D. For assets with only incorrect coordinate location information but already located within the mapped inventory, only the corrected coordinates will be provided. Necessary data will be logged so that uncorrected positions can be post-processed and coordinated with DWM GIS division, at the discretion of the **County**, to obtain more accurate positions. New work shall be similarly located.

3.04 DELIVERABLES

- A. Map corrections to the printed map will be illustrated on the printed map with red markings and delivered at the completion of each week. Supplemental sketches will be provided, as necessary, to clearly depict the actual site conditions and new work.
- B. Coordinate and attribute data will be provided in GIS electronic format on a weekly basis as described in these Specifications or as directed by the **County**.

END OF SECTION

SECTION 01060 REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. The **Contractor** shall, without additional expense to the **County**, be responsible for obtaining National Pollutant Discharge Elimination System (NPDES) permits for discharges from this project to stormwater systems or watercourses, 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 be responsible for 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 stormwater discharges associated with industrial activity. These are 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 that 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) of this subsection, the term includes, but is not limited to, stormwater 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 stormwater. The following categories of facilities are

considered engaging in "industrial activity" for purposes of this subsection:

- (i) 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 activities covered by the regulation on or after October 1, 1992.
- E. The **Contractor** shall complete EPA Form 3510-2F. A "Guidance Manual for the Preparation of NPDES Permit Applications for Stormwater Discharges Associated with Industrial Activity," as published by 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

The **Contractor** shall perform the 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

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 such relocations shall be included in the bid price.

1.03 EXISTING UNDERGROUND PIPING, STRUCTURES, AND UTILITIES

- A. The **Contractor** shall exercise extreme care before and during excavation to locate and flag various sewer, water, gas, telephone, electrical, or other utility lines not shown on the Drawings to avoid damage. Should damage occur to an existing line, the **Contractor** shall bear the costs associated with the damage and repair the line at no cost to the **County**.
- B. The **Contractor** shall note that 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 **Contractor** shall notify the **County** of existing piping and utilities that interfere with new construction and shall reroute or relocate the pipeline or utility as directed before any piping and utilities not shown on the Drawings are disturbed.
- D. The **Contractor** shall exercise care in any excavation to locate existing piping and utilities. Utilities that 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 at the **Contractor's** expense as directed by the **County**.

1.04 HAZARDOUS LOCATIONS

The **Contractor** shall check existing wet wells, manholes, and related areas that are hazardous locations, to determine whether adequate oxygen is available whenever personnel are working in these areas. The **Contractor** shall exercise caution because explosive concentrations of sewage gas may be present and the wet well may be deficient in oxygen.

1.05 CONNECTIONS TO WORK BY OTHERS

- A. Under this Contract, and as shown on the Drawings, the **Contractor** shall construct pipelines that are to be connected to pipelines constructed by others.
- B. The **Contractor** shall connect pipelines built under this Contract to pipelines constructed by others by removing the plugs and making the connection.
- C. The **Contractor** shall lay any pipelines (under this Contract) not constructed by others 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

The Contractor shall be responsible for any cost of water used on the Project. A water meter and backflow device shall be obtained from the DeKalb County DWM at 774 Jordon Lane, Suite 200 for recording water used for cleaning and other Work items requiring water. Contractor to be reimbursed for metered water usage through the Owner's Allowance item in the Contract.

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** Project Manager and Superintendent
 - 3. Others as appropriate or required by the **County**
- 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 (RFIs)
 - c. Change Documents
 - 1. Requests for Proposals (RFPs)
 - 2. Work Authorizations
 - 3. Proposed Change Order Requests (CORs)
 - d. Field Decisions and Clarification Memos
 - e. Applications for Payment
 - f. Change Orders

6. Procedures for maintaining Record Documents (Section 01350 - Project Document Tracking and Control Systems)
7. Periodic Meeting Schedule
8. Mobilization Form Submittal – **Contractor** shall complete and submit a Mobilizations Request form after the following have been completed:
 - a. NTP Received
 - b. Preconstruction Meeting completed and minutes reviewed and accepted
 - c. Safety Plan, Construction Quality Plan, and Permit/ Easement Plan submitted to and approved by **County**

1.03 PERIODIC PROGRESS MEETINGS

- A. Project Progress Meetings shall be held Semi-monthly (2x/month) throughout the project duration. The **County** may alter the timing of, or add supplemental, scheduled periodic progress meetings, at its discretion.
- B. The Project Progress Meetings shall be attended by the following:
 1. **County's** representative(s)
 2. **Contractor's** Project Manager, Superintendent, and other appropriate representative(s)
 3. Others as appropriate or required by the **County**
- C. The 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 affecting progress
 5. Field observations, including Safety Report(s)
 6. Status of pending RFIs and changes
 7. Stakeholder complaints/public outreach
 8. Status of permits and easements
 9. Status of invoicing
 10. Other business

1.04 OTHER MEETINGS

- A. Schedule Progress Meetings

As per Section 01310 - Construction Schedule, during semi-monthly progress meetings, the **Contractor** shall submit a Look-Ahead Schedule. This schedule shall cover six (6) weeks: the immediate past two weeks, the current week and following

week, and the subsequent two weeks. This schedule shall include activities that are complete, started, incomplete or underway, or scheduled to be performed during this six-week timeframe. Results of the Progress meetings shall be reported in the Project Progress Minutes.

- 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. Specially-called meetings shall be held as warranted by:
 - 1. Unforeseen developments during construction or as needed to coordinate special events, such as tie-ins or system shutdowns
 - 2. Concerns regarding individual project performance and adherence to the schedule of construction

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 labor, equipment, tools, materials, and performing operations required to complete the Work satisfactorily, in-place, as specified, and as indicated on the Drawings.
- B. The 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 portions of the Work, including quantities and unit prices, aggregating the Contract Price. The **County** shall not approve an unbalanced breakdown providing for overpayment to the **Contractor** on items of Work that would be performed first.
- B. The **Contractor** shall 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 Work shall be in accordance with the unit price bid items in the Bid Schedule and shall be full compensation for 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 shall be considered incidental to the Work and no additional compensation shall be allowed.
- B. Payment shall be made only for the actual quantities of work performed in compliance with the Drawings and Specifications. The **Contractor** shall 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 shall 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 As-Built Drawings lengths, dimensions, quantities, etc. shall be determined by a survey after completion of the required Work. The precision of final payment quantities shall match the precision shown for that item in the Bid Schedule. Measurements shall 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

<u>Item</u>	<u>Method of Measurement</u>
TN	Ton - Weight Measure by Scale (2,000 pounds)
VF	Vertical Foot - Field Measure

PART 2 – UNIT PRICE BID ITEMS

2.01 DUCTILE IRON PIPE (DIP), RESTRAINED JOINT (RJ), CLASS 250

- A. Measurement for payment of furnishing and installing ductile iron water distribution pipe shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment shall constitute full compensation for work necessary for installation of ductile iron water distribution pipe, including but not limited to furnishing, transporting, storing, and installing the pipe; fittings (6-inch to 12-inch); thrust blocks or concrete collars; electromagnetic 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, free boring under driveways or trees, utility support system, dewatering, temporary water service, backfilling, and compaction; concrete cap; cleaning, treating, and testing; and other specified work.
- B. Depth of installation is as indicated on the drawing details, or defined in the specifications, or as directed by the **County**. Excavation is unclassified.

2.02 DUCTILE IRON WATER PIPE (DIP), RESTRAINED JOINT (RJ), CLASS 250, ADDITION FOR DEEP BURY, 1-4 FEET DEEPER THAN SHOWN ON THE DRAWINGS

- A. Measurement for payment of Ductile Iron Water Distribution Pipe, Push-On Joint (size) Diameter, Addition for Deep Bury, 1 to 4 feet deeper than shown on the drawings shall be on a per linear foot basis. Payment for installing water main pipe at a lower grade than indicated shall be based upon the actual depth as instructed by the **County**, in accordance with the provisions of the contract documents. Payment for water main installed at depths greater than that shown in the drawings shall be made in addition to the unit prices in this section. Payment shall constitute full compensation for labor, materials, and equipment necessary to install the water distribution pipe at a depth greater than 4 feet.
- B. Depth of installation is as indicated on the drawing details or defined in the specification, or as directed by the **County**. No extra compensation shall be made for depths greater than 4 feet or not shown on the approved drawings without approval from the **County**. Excavation is unclassified.

2.03 RESTRAINED JOINT DUCTILE IRON FITTINGS

Measurement for payment to furnish and install ductile iron fittings 16-in and larger shall be at the unit price bid per ton for such approved fittings furnished. Weight shall be based on published weights provided by the fitting manufacturer. Payment for furnishing and installing fittings shall constitute full compensation for work required to furnish and install the fittings, including but not limited to: providing and installing joint restraint; purchasing, transporting, storing, and delivering to the worksite the necessary materials, tools, equipment, and labor; saw cutting asphalt pavement,

excavation, dewatering, backfilling, compaction, concrete cap, site restoration, and cleanup; removal and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system; dewatering, temporary water service, cleaning, treating, and testing; and other specified work.

2.04 POLYETHYLENE PIPE WRAP

Measurement for payment of furnishing and installing one layer of polyethylene pipe wrap shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place.

2.05 CATHODIC PROTECTION

Payment for the installation of the cathodic protection system shall be made under on a per each basis. Payment shall be based on actual quantity of each cathodic protection system furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for all tools, materials, equipment and labor necessary for the installation of the cathodic protection system as shown on the drawings. Cathodic protection system does **not** include polyethylene pipe wrap, which shall be paid under separate bid item(s).

2.06 GATE VALVES WITH VALVE BOX AND EXTENSION, 6-INCH TO 16-INCH

Measurement for payment to furnish and install gate valves shall be on a per each basis. Payment shall be based upon actual quantity of each valve furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for 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 other specified work.

2.07 GATE VALVES WITH VAULT AND EXTENSION, 20-INCH TO 30-INCH

Measurement for payment to furnish and install gate valves shall be on a per each basis. Payment shall be based upon actual quantity of each valve furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for 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 of valve and concrete vault, backfilling and compaction; cleaning, treating and testing; cleanup, including valve box, extension, concrete collar, valve box and marker, if required; and other specified work.

2.08 AIR VACUUM RELEASE VALVE WITH VAULT

Measurement for payment to furnish and install air vacuum release valve shall be on a per each basis. Payment shall be based upon actual quantity of each valve furnished and installed, in

accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for 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 of valve and concrete vault, backfilling and compaction; cleaning, treating and testing; cleanup, including valve box, extension, concrete collar, if required; and other specified work.

2.09 FIRE HYDRANT ASSEMBLY

Measurement for furnishing and installing fire hydrant and flushing hydrant assemblies shall be at the unit price bid per each and shall include, but is not limited to transporting, storing, furnishing, and installing. Payment for furnishing and installing fire hydrant and flushing hydrant assemblies shall be made at the unit price per each and shall constitute full compensation for the construction of fire hydrant assemblies, installed complete, including fire and flushing hydrant, fire and flushing hydrant extensions, fire and flushing hydrant tee, required linear feet of 6-inch restrained joint ductile iron piping, restrained valves, and valve boxes and markers; concrete collars and thrust blocks; gravel pockets, and 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; removal of any existing hydrants, 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 other specified work.

2.10 SALVAGE EXISTING FIRE HYDRANT

Measurement for payment of salvaging existing fire hydrants shall be on an each basis and shall include work associated with removal of existing hydrant and all components and delivery to designated DWM facility.

2.11 TAPPING SLEEVE AND VALVE

Measurement for payment to furnish and install tapping sleeves and valves shall be based upon actual quantity, each, of tapping sleeves and valves furnished, installed complete, in accordance with the requirements of the Contract Documents. Payment for furnishing and installing tapping sleeves and valves shall be made at the unit price per each and 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, valve cover and marker, if required; and other specified work.

2.12 CONNECT TO EXISTING WATER LINES

Measurement and payment for connecting to existing water lines is on a per each basis. The cost

of all labor, materials, equipment, etc. necessary for making the connection to existing water lines with solid sleeves or other manner shall be included in the unit price bid for Connections to Existing Water Mains.

2.13 COPPER SERVICE LINE INSTALLATION

Measurement for payment for furnishing and installing 1-inch or 2-inch copper water service lines shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment shall constitute full compensation for work necessary for installation of copper service line from the water main to the meter stop in the meter box at the property line, including but not limited to furnishing, transporting, storing, and installing the pipe; thrust blocks or concrete collars; electromagnetic 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, free boring under driveways or trees, utility support system, dewatering, temporary water service, backfilling, and compaction; concrete cap; cleaning, treating, and testing; site restoration; and other specified work.

2.14 WATER SERVICE

A. SERVICE LINE REPLACEMENT

Measurement for payment for water service transfer shall be on a per each basis for the actual number of water services transferred from an existing water main to a new, relocated water main. 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 main line tap, fittings, piping, and restoration to transfer the service, including pressure testing and disinfection, and connection to the meter. Work shall be performed by a licensed plumber. This 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 other specified work.

2.15 ROCK EXCAVATION

Measurement for payment for rock excavation shall be on a per cubic yard basis, if exceeded what is included in the bid tab. Payment shall constitute full compensation for work necessary for rock excavation in accordance with the Plans and Specifications, including, but not limited to, labor, materials, and equipment.

- A. For pipeline excavation, the volume of rock excavation shall be calculated by multiplying allowable specified trench width times the horizontal distance along the survey centerline times vertical height, rounded to nearest cubic yard, of rock excavation.
- B. For 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.

- C. No payment shall be made for rock excavation below the required grade or outside the width pay limits as specified in Section 02324 - Trenching and Trench Backfilling.
- D. Payment shall include the cost of removal and lawful disposal of the rock from the site.
- E. Payment for rock excavation associated with micro-tunneling, directional drilling, tunnel construction, and tunnel access shaft shall be considered incidental to the respective Work.

2.16 ASPHALT PAVEMENT REPLACEMENT

- A. Measurement for payment Permanent Asphalt pavement replacement shall be at the unit price bid per ton. Payment shall be full compensation for furnishing labor, materials, tools, testing, and equipment necessary to install Base for Permanent Asphalt Pavement Replacement, and shall include furnishing, hauling, milling, preparation, placement of base materials, bit tack coat, and prime coat for permanent asphalt paving. Pavement thickness shall be as shown on the standard details.
- B. All pavement damaged outside the payment width shall be repaired as specified by the **County** and no additional payment shall be allowed for such work outside the payment width.

2.17 CONCRETE CURB AND GUTTER, CONCRETE CURB, AND CONCRETE VALLEY GUTTER

- A. Measurement for payment of concrete curb and gutter, concrete curb, or reset granite curb, and concrete valley gutter shall be made on a per linear foot basis.
- B. Payment shall constitute full compensation for work necessary to install the curb and gutter, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, and delivery to the work areas; excavation, backfilling, compaction, placement, and restoration of property; disposal of existing materials, and joints; special construction at driveways and other entrances or points; and cleanup. Payment shall include approaches through curb and gutter indicated on the Plans.

2.18 CONCRETE DRIVEWAY/SIDEWALK

Measurement for payment for concrete driveway/sidewalk removal and replacement shall be per square yard. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish concrete sidewalk, and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; joints and special construction at driveways or other entrances and points; hauling and placing materials; and incidentals necessary to complete the Work. Payment shall include approaches through curb and gutter indicated on the Plans.

2.19 ABANDON EXISTING WATER MAIN WITH GROUT

Measurement for payment for concrete abandon existing water main in place with grout shall be per cubic yard. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish grout installation, and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; hauling and placing materials; and incidentals necessary to complete the Work.

2.20 CONCRETE ENCASEMENT

Measurement for payment for concrete encasement on proposed and existing utilities shall be per cubic yard. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish concrete installation, and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; hauling and placing materials; and incidentals necessary to complete the Work.

2.21 PAVEMENT MARKING AND STRIPING

- A. Measurement and payment for pavement striping shall be on a per linear foot basis.
- B. Measurement and payment for pavement arrows and lettering shall be on a per each basis.
- C. Any signage removed as part of construction shall be replaced at **Contractor's** expense and no cost to the **County**.

2.22 STORM DRAINAGE SYSTEM

- A. Storm Drain Catch Basins: Payment for catch basins removed or damaged during construction shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish installation and authorized by the Engineer.
- B. Storm Drain Pipe: Payment for culverts, reinforced concrete pipe, corrugated metal pipe, or ductile iron pipe as appropriate, shall be made for the actual lengths constructed and authorized by the Engineer.

2.23 EROSION AND SEDIMENTATION CONTROL AND TREE PROTECTION

- A. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls, except as noted below. Items for payment shall include those controls and protection for the Project Site. All other temporary and/or permanent erosion and sedimentation control costs shall be included in the unit price bid for the item to which it pertains.

- B. No payment shall be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.
- C. Silt Fence: Measurement for payment of furnishing and installing silt fence shall be on a linear foot basis. All costs for silt fences including installation, maintenance, repair and removal, shall be included in the unit price bid for Silt Fence. Measurement shall be made of actual quantity constructed which had been authorized by the Engineer. Fence constructed to replace damaged fence shall not be eligible for payment.
- D. Tree Protection: Measurement for payment of furnishing and installing tree fence shall be on a linear foot basis. All costs for tree protection including installation, maintenance, repair and removal, shall be included in the unit price bid for Tree Protection. Measurement shall be made of actual quantity constructed which had been authorized by the Engineer. Tree protection constructed to replace tree protection shall not be eligible for payment.
- E. Rip Rap: The cost of rip rap, including materials, placement, maintenance, and filter fabric, as shown on the Drawings, specified or directed by the Engineer shall be included in the price bid for Rip Rap.
- F. Inlet Sediment Traps: Measurement for payment for inlet sediment traps shall be on per each basis. All costs for silt control gates, including installation, maintenance, repair and removal, shall be included in the unit price bid for Inlet Sediment Traps. Quantities for payment shall be based on actual quantity constructed and authorized by the Engineer.
- G. Grassing: Payment for grassing shall be on a per acre basis. Partial payment will be made based on the estimated area of grass established (not just seeded) divided by the estimated total area to be grassed.
- H. Mulching: Payment for mulching shall be on a per ton basis. Partial payment will be made based on the estimated area of mulch installed.
- I. Sod: Payment for Sod shall be on a per square yard basis. Partial payment will be made based on the estimated area of grass established (not just seeded) divided by the estimated total area to be grassed.
- J. Water Quality Monitoring, Sampling, and Inspections: Payment for compliance with NPDES permit requirements shall be made under a lump sum bid to be paid monthly in equal payments. The lump sum bid shall be full compensation for compliance with NPDES requirements as described in Specification Section 01060 including the employment of an Environmental Professional for specified services. This item is inclusive of all associated fees to the Georgia Environmental Protection Division (EPD), DeKalb County, and other agencies as necessary for the compliance with erosion

control requirements as specified and shown on drawings and required by law or regulation.

2.24 TRAFFIC CONTROL

Payment for traffic control shall be made at the lump sum price bid to be paid monthly in equal payments for all traffic control required for all force main work, including all lane closures, sign boards, cones, jersey barriers, detours, signage and other incidentals required by the government entity controlling the right-of-way.

2.25 TREE REPLACEMENT

Measurement and payment for tree replacement shall be made on a per each basis. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and replacement trees and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; hauling and placing materials; and incidentals necessary to complete the Work.

2.26 ABANDON EXISTING VALVE BOX

Measurement and payment for abandonment of existing valve box shall be made on a per each basis. Payment shall constitute full payment for work necessary to abandon existing valve box including closure of the valve, removal of valve stem, removal of valve box frame and cover, filling of hole with concrete and restoration of pavement.

2.27 MOBILIZATION/DEMobilIZATION

The lump sum amount for MOBILIZATION will be eligible for payment upon the completion of all related preparatory work after transportation of the materials and equipment necessary for the first 45 days of the Contract Time.

2.28 REMOVE/RESET MAILBOXES.

Measurement and payment for removal and resetting of existing mailboxes shall be on a per each basis.

2.29 WATER VALVE COVER AND MARKER DISC

Measurement for payment to furnish and install water valve cover and disc shall be on a per each basis. Payment shall be based upon actual quantity of each valve cover and disc furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for work necessary to install the valve cover and disc, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, delivery to the work areas, placement, , concrete pad, if required; and other specified work.

2.30 TRAFFIC LOOP REPLACEMENT

Measurement for payment for removal and replacement of traffic loops shall be on a per each basis.

2.31 REMOVE WATER MAIN

Measurement for payment to remove and dispose of existing water main in accordance with all local, state and federal laws and ordinances.

2.32 DISCONNECT TIE-INS FROM EXIST. 30"

Measurement for payment for disconnecting tie-ins from existing water line shall be on a per each basis and shall include sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the plans or directed by the Utility Owner or GDOT Project Manager. Provide a watertight pipe or cap or plug and resistant mechanism to seal off existing mains indicated to remain in service. If water main is to be abandoned or removed and not specified to be grout filled, seal ends with a pipe cap or plug or with a masonry plug and minimum 6-inch (150mm) cover of concrete on all sides around the end of the pipe.

2.33 JACKING AND BORING

Measurement for payment for jacking and boring shall be on a linear foot basis. Payment shall constitute full compensation for work necessary for a complete installation, including, but not limited to: labor, materials and supplies; 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 material; surface settlement monitoring; on-site storage, delivery to the work areas, site preparation, backfill, complete restoration; and cleanup.

2.34 LANDSCAPING

Payment made for landscaping is for landscaping items removed and replaced that are not covered by other proposal items. The price shall include, but not limited to all labor, materials, laying and staking, fertilizing, mulching and guarantees involved in the installation. Payment shall be made at the lump sum price bid.

2.35 REMOVE & REPLACE GUARDRAIL

Guardrail will be measured in place and the unit of measurement shall be in linear feet.

Payment for removing and replacing guardrail will be made at the unit price bid per linear foot. The unit price bid shall be full compensation for all tools, labor, equipment, materials, traffic control, temporary guardrail for the protection of traffic, weather and any incidentals necessary for the removal and replacement of guardrail. The unit bid shall be for guardrail of any size and type. Existing guardrail shall be removed and replaced the type of guardrail matching the existing and compliant with current GDOT specifications and standards.

2.36 CUTTING & CAPPING EXISTING WATER MAINS

Measurement and payment for cutting and capping existing water mains shall be on a per each basis. The unit price shall be full compensation for disconnecting by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Plans or directed by the **County**. Provide a watertight pipe cap or plug and restraint mechanism to seal off existing mains indicated to remain in service. If water main is to be abandoned or removed and not specified to be grout filled, seal ends with a pipe cap or plug or with a masonry plug and minimum 6-inch (150 mm) 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. Abandoned manholes and water mains greater than 6-inch (150 mm) shall be filled with flowable fill at the locations indicated on the Plans. Air release valves and water service connections along the abandoned main shall be plugged prior to grouting. Prior to backfilling, the bottom of the manhole shall be broken up in such a manner that water will readily pass through. The top portion of the manhole structure shall be removed in order to establish a minimum of 3 feet cover from subgrade or finished grade when not under the pavement and filled with sand or suitable backfill. Water mains shall be flushed prior to placement of flowable fill. Use concrete or grout pumps capable of continuous delivery at planned placement rate with sufficient pressure to overcome friction and fill the sewer main.

2.37 BLOW-OFF VALVE ASSEMBLIES

Blow-off assemblies shall be measured on an per each basis on the number of each blow-off assembly acceptably installed.

PART 3 – ALLOWANCES

3.01 OWNER DIRECTED ALLOWANCE

- A. The allowances specified in the Bid Schedule are to establish a fund to pay the cost of items for which the **County** could not establish accurate quantities and/or detailed scope of work. The **Contractor** shall submit for review and approval by the **County** a proposed cost of services prior to performance of the Work. This Work shall be completed only at the written direction of the **County** after the cost of such Work has been approved
- B. The **Contractor** shall be responsible for the payment for these services to the appropriate payee providing such service, and shall submit evidence of payments to the **County** prior to their inclusion in the progress payments.
- C. The **County** shall make payment for invoices submitted by the **Contractor** subject to the Contract Documents. **Contractor** shall not receive any additional compensation for bond or insurance costs for work executed using allowance funding.
- D. Allowance allocations shall only be paid to the **Contractor** for completed work authorized by the **County**. Allowance dollar amounts not expended shall revert to the **County** at the completion of the project. Should the final allowance costs be less than the specified amount of the allowance, the Contract shall be adjusted accordingly by

change order. The amount of change order shall not recognize any changes in handling costs at the site, labor, overhead, profit, and other expenses caused by the adjustment to the allowance item.

PART 3 – PRODUCTS (NOT USED)

PART 4 – EXECUTION (NOT USED)

END OF SECTION 01210

SECTION 01300 SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Preparing and processing of submittals and Requests for Information (RFI)s 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. Submittals and RFIs shall be submitted to the **County** via the **County's** Document Control Tracking System (SharePoint). No email submittals shall be allowed for approval. One copy of each submittal shall be uploaded by the **Contractor** into the software program named by the **County**. The **County** may determine that certain submittals also shall be submitted in hard copy form.
- H. Contractor shall allow 15 calendar days for review of Submittals and 5 days for RFI responses.

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 shall be the same as for larger sheets
- C. Samples:
 - 1. Two sets of each shall be submitted with the original submittal.
 - 2. One set shall be returned.
 - 3. If additional sets are needed by other entities involved in Work represented by the samples, these shall be submitted with original submittal.

1.04 COORDINATION OF SUBMITTALS

Coordinate submittals and activities that shall be performed in sequence or of different types for the same product or system 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 15 days for review and processing time, including resubmittals if necessary; failure of the **Contractor** in this respect shall 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 shall 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 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 shall be accepted from the **Contractor** only.
 - 2. Submittals received without a transmittal form shall be returned without review or action.

3. Transmittal form: The **Contractor** shall use a form acceptable to the **County**, with space provided on the 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. The **Contractor** shall complete a separate transmittal form for each submittal, also including 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. Compliance with the specific standards referenced
 6. Coordination requirements, including the 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. Documents shall be identified as indicated for submittals.
 4. Space for **County's** action marking shall be adjacent to the title block.

3.04 PRODUCT DATA

- A. Submit 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, which 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 the proposed product.
 - 2. Where selection is required, provide the full set of 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, deliveries, or other similar characteristics, attach descriptions of such limitations.
 - 5. Where selection is required, the first submittal may be a single set of options; after return of submittal with selection indicated, submit standard number of sets of 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 shall 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 shall be reviewed.
- C. Action markings for submittals for approval shall be as follows:
 - 1. NO EXCEPTIONS TAKEN (NET): Indicate that the submitted item is released for manufacture
 - 2. MAKE CORRECTIONS NOTED (MCN): Indicate that the submitted item is released for manufacture with the submittal complying with the comments
 - 3. AMEND AND RESUBMIT (AAR): Indicates that the submittal shall be revised or a new submittal complying with the comments made shall be prepared.
 - 4. REJECTED (REJ): Indicates that the submitted item does not comply with contract requirements and that another selection shall be made and the submittal process repeated.
 - 5. SUBMIT SPECIFIED ITEM(S) (SSI): Indicates that the submittal shall submit specified item(s) based on the specifications or as stated by the County

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

- A. Submittals shall be returned to the **Contractor** via SharePoint workflow.
- B. The **Contractor** shall address resubmittals in the same manner as original submittals, with changes other than those requested by the **County**, clearly indicated.
 - 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: The **Contractor** shall 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 schedule its Work to complete the Project or any part of the Project earlier than is stipulated in the Contract and the milestone requirements. 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 **Contractor's** 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 shall 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 (CPM). The Work required by this section includes the requirement to prepare, maintain, and update the 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. **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 shall consult with all key subcontractors and suppliers to obtain concurrence with the feasibility and achievability of **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 USB flash drive(s) 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 shall prosecute the Work in compliance with the Contract requirements. **Contractor** shall maintain a current and accurate schedule that is properly and timely monitored, updated, and revised as Project conditions may require and as required by the Contract Documents.
- D. **Contractor's** Construction Schedule shall be prepared using the latest version of Oracle Primavera P6 Enterprise Project Portfolio Management (P6) Release 8. Any and all costs incurred by the **Contractor** in researching, training, and/or educating

its personnel in CPM and/or 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 analyses, 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 Notice to Proceed. Requirements for the final CPM construction and final schedule of values are further described hereinafter. **Contractor's** Application for Payment shall 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. PM 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 shall 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 P6 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 shall include review periods and permit schedules shall 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 shall be as 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. At a minimum, notation on each activity line shall include activity descriptions, total float, and durations.

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 to clearly distinguish 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 shall 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; e) activities relating to different areas of responsibility, such as subcontracted Work that is distinctly separated from that being done by the **Contractor** directly; 5) labor resources distinguished by craft or crew requirements; 6) equipment and material resources distinguished by equipment and material requirements; 7) distinct and identifiable subdivisions of Work, such as cleaning, pre-liner installation inspection, CIPP installation; 8) locations of Work within the contract limit lines that necessitate different times or crews to perform; 9) outage schedules for existing utility services that will be interrupted during the performance of the Work; 10) phases; and 11) 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 with 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 shall 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 copies of the CPM graphic logic network
 2. Three copies of a computerized, tabular report in which activities have been sequenced by early starting date
 3. Two copies of the schedule on a USB Flash Drive
 4. Three 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 analyses, and monetary value of activities. The intent is to reach a clearer understanding of the CPM and achieve 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. The **Contractor** shall comply with such directive.
- B. The **Contractor** shall use the services of a scheduler who has verifiable training and credentials in preparing and maintaining computerized CPM Construction Schedules using P6 software as specified herein. The scheduler shall 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 P6 Release 8 or equal.
 2. Submit to the **County** 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 analyses, and written narrative shall be submitted in three hard copies and two data copies on a USB flash drive. Submittals shall 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 P6 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 single-shift 5-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. USB flash drive copy of 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. **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 **Contractor**; b) how the requirements of the Contract Documents will be monitored and enforced by the **County**; c) how long-lead items and time requirements for the Work by subcontractors shall be identified and included in the Contract Baseline Schedule; d) testing and startup; e) coding and logic for the Contract Baseline Schedule; and f) 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 that shall 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 4 percent 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 P6 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 Number
 - 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 shall be tracked on the Schedule of Values.
- D. Allowance Accounts (AL): Payment for Allowance Accounts shall be based upon invoices submitted by the **Contractor** subject to conditions and limitations of the Contract Documents. Refer to Section 01210 - Measurement, and Payment, for requirements. The Allowance shall be adjusted to the actual amount paid for such services, and adjusted by CO, either at the end of that phase of the Work or at the completion of the Work. The **County** shall have sole discretion on determining when to make adjustments to the Allowance.
- E. A new account shall be added to the Schedule of Values for approved CO work. Payment for Time and Expense CO work 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. Update shall be created by updating the mathematical analyses 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 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 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 shall 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 shall 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. If the project is behind schedule, progress along all paths with negative float, along with the reasons for the delay.
 5. A description of all revisions made to the schedule, including: all accepted added, deleted, and revised activities; 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** shall 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 semi-monthly progress meetings, the **Contractor** shall submit a Look-Ahead Schedule. This schedule shall cover 6 weeks: the immediate past two weeks, the current week and following week, and the subsequent 2 weeks. This schedule shall include all activities that are complete, started, are incomplete or underway, or scheduled to be worked during this 4-week timeframe. 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. The **Contractor** shall review the Project Schedule and progress of Work and comparison with the latest approved baseline schedule. This shall include an analysis of Work accomplished since previous meeting, offsite fabrication status and issues, material delivery status and issues, actual and potential schedule

slippage, problems arising from proposed changes, and other factors that might affect the Work

- C. Each activity noted above shall be identified by activity number corresponding to the accepted CPM Construction Schedule and detailed description of the activity.
- D. The Look-Ahead Schedule shall be delivered to the **County** 24 hours prior to the semi-monthly progress meeting.
- E. The Look-Ahead Schedule shall be in a format approved by the **County**.
- F. Tabular reports for manpower and equipment resources shall be provided for and with each Look-Ahead Schedule.

3.05 CPM CONSTRUCTION SCHEDULE REVISIONS

- A. Contract Baseline Schedule shall not change, except as noted below:
 - 1. Significant changes in scope requiring redesign of major project elements and additional time to incorporate the changes
 - 2. Budget constraints deferring construction funding, resulting in placing the project on hold
 - 3. A significant variance in the actual construction contract NTP date and the construction NTP date at the time of award
 - 4. Any approved change orders that result in significant Project Scope Changes, as determined by the **County**
 - 5. Any baseline change shall be accompanied with a Baseline Change Directive.
- B. 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 5 percent 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 **County** 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 CO has been issued that changes, adds, or deletes scheduled activities, or that affects the time for completion of scheduled activities.

- C. When instances requiring revision to the CPM construction schedule occur, the **Contractor** shall submit the proposed revised CPM Construction Schedule within 10 working days after receiving direction from the **County** to provide such schedule. No additional payment shall 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.
- D. 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 the **Contractor** experiences delays 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 shall incorporate all actual start and finish dates, actual durations of activities, and 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 timeframe 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** shall validate this As-Built Schedule. All requests for time extension shall be based upon an analysis of this As-Built Schedule. The critical path shall be established and all **County**-caused delays on the critical path shall be identified. The time extension shall 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 contract documentation in coordination with the overall Project Schedule established by these Specifications and the **Contractor**. The **Contractor** shall utilize this system for document tracking and control. The software will:
1. Facilitate communication between the **County** and **Contractor**.
 2. Support turnaround time with regard to responses and approvals.
 3. Provide a central location for Project information to support 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 system that resides on the DWM server to generate documents in the proper format for submission to the **County**. The **Contractor** shall access the system 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 be required to generate Project documents and records utilizing the aforementioned system. The **Contractor** shall be required to 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, onsite for the entire duration of the Project. Documents shall be scanned in and attached to the appropriate DTCS document, including submittals, shop drawings, operations & maintenance manuals, and other documents requested by the **County**.
- E. The **Contractor** shall utilize the document control system to create and maintain Project documents, including, but not limited to the following:
1. Drawings
 2. Submittals
 3. Transmittals
 4. Risk Register
 5. Requests for Information (RFIs)
 6. Requests for Proposal (RFPs)
 7. Change Requests (CRs)
 8. Change Orders (COs)

9. Inspector Daily Reports
10. Field Decisions/Field Changes, and Clarification Memos
11. Notice of Non-Compliance
12. Construction issue memos
13. Final Inspections/Punch lists
14. Meeting Minutes and agendas
15. Correspondence
16. Work Plans
17. Startup Plans
18. Equipment Operations & Maintenance training
19. Spare parts lists

- 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 P6 software system. This person shall have a minimum of 3 years of experience in project controls. This person shall also work closely with the Contractor's management team and the **County** to deliver the documents outlined in this Section.
- G. Software Support
- The **Contractor** shall be required to establish an internet connection using DSL or better to connect to the DTCS to permit the forwarding and receipt of documents.
- H. The **Contractor** shall be responsible for the cost of training for 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 calendar 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 calendar days following the pre-construction meeting date. This shall be operational from the **Contractor's** administrative field office location.

1.03 DRAWING LOG

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 subsequent revisions to these drawings and any sketches resulting from clarification memos, RFPs, RFD's, RFS's, , RFIs, Field Orders, Change Requests, Change Directives, and Change Orders (COs). It shall be the **Contractor's** responsibility to utilize the latest drawings and sketches in the performance of the Work.

1.04 SUBMITTALS/SHOP DRAWINGS

Submittal management shall be in accordance with specification 01300. The **Contractor** shall utilize the DTCS to log and track submittals, as well as generate associated transmittal letters.

- A. Guarantees/Warranties: A list of required Guarantee/Warranty submittals shall be entered into the DTCS by the **Contractor**.
- B. Work Plans, Startup Plans, O&M Submittals, and Spare Parts: Testing, Startup, and O&M submittals shall be entered into the DTCS by the **Contractor** as individual submittals. These submittals shall be identified as individual submittals within the submittal packages identified.

1.05 CORRESPONDENCE

The **County** shall monitor and manage the correspondence, Non-Compliance Notices, Field Decisions and Clarification Memos, and Construction Issue Memo logs. The **Contractor** shall generate Project correspondence within the DTCS, and forward the correspondence to the **County**.

1.07 RISK MANAGEMENT PLAN AND RISK REGISTER

Contractor shall provide a detailed and specific description of their approach to the management of risks associated with the Project, including permitting, design, construction, and testing and the **County's** operation and maintenance of the Project. Such risks shall include those allocated under the Contract to the County as well as those allocated to the **Contractor**.

Contractor is to develop and maintain a Risk Management Plan that can be used by the **County** to understand and evaluate the **Contractor's** understanding of the biggest risks and challenges to the Project, and how it intends to mitigate such risks. The **Contractor** shall provide sufficient information to enable the **County** to understand this evaluation. The Risk Management Plan shall include:

- A. A detailed risk register that identifies Project risk, the likelihood of such risk manifesting itself on the Project, the severity of such risk and a mitigation plan for such risk.
- B. An identification of and elaboration upon features of the **Contractor's** Design (if Design-Build type delivery) and Construction Plan that the **Contractor** considers unique and/or innovative relative to reducing or eliminating Project risk.

The **Contractor, County and Construction Manager** will review the Risk Register during the Project's progress meetings. The **Contractor** shall update the project Risk Register and provide these updates to the project team through the DTCS system on a monthly basis.

1.08 REQUEST FOR INFORMATION & ANSWERS

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 them to the **Contractor**. The DTCS shall track “Ball in Court” for 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 shall identify the date of the request and the originator, responsible party for a response and the date of the response.

1.09 CHANGE DOCUMENTS

Change documents include Request for Proposals (RFPs), Change Requests (CRs), and Change Orders (COs). Change documents will be monitored and managed by the **County** utilizing the DTCS.

1.10 DAILY INSPECTION REPORTS (DIR)

Each Construction Management (CM) inspector shall prepare a DIR for each day of work the inspector is at a fabrication facility or the construction site. The CM shall review reports and compile them, along with any QC records provided by the Construction Contractor (CC) for the work and any independent materials testing or survey results, in an overall “daily record” for entry into the CIP Program SharePoint site. The CM is responsible for approving DIRs and archiving them. DIRs shall be used to record the weather for the day, CC equipment and labor resources observed to be working, and inspections performed, observations, significant daily events, problems, and communications pertaining to the quality of the work. Entries shall be clear, concise, and factual. Personal opinions are not to be recorded. Inspections will be documented in detail recording how the work is being done, comparing the work to the Contract documents, and making a statement as to whether the work is in compliance with the Contract documents, including environmental compliance requirements.

DIRs include the following information:

- Project name, contract number, date, and QA inspector's name
- Weather conditions
- CC's name and resources (labor and equipment on each item of work inspected)
- Sub-contractors on site and work being performed
- Schedule activity for each item of work inspected
- Hold or witness points inspected
- Observations of inspections and time of inspection, including out of sequence schedule activities observed
- Description of deficiencies issued and/or corrected and status of open deficiencies
- Re-inspections of work resulting in close-out of non-conformances
- Site visitors
- Photos and videos documenting the work—at least one per day for each work day; aerial

photographs (via drone or other means) are welcome

1.11 PUNCH LISTS

The **Contractor** will monitor and manage punch lists, and will create punch lists to be forwarded to the **County**. 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.

1.12 MEETING MINUTES AND AGENDA

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

1.13 PROGRESS PAYMENTS /REQUISITIONS FOR PAYMENT

The Contractor is responsible for submitting monthly progress payment applications along with an update of the approved project schedule and a schedule summary. Progress payment applications shall be submitted by the last Friday of each month and as specified in Section 01310. Maintenance of the "As-Built" record documents by the **Contractor** shall be verified before processing shall be approved. Failure of a **Contractor** to maintain project record documents, maintain current and properly prepared daily reports, or submit the project schedule update per Section 01310 shall be just cause for withholding the monthly or final payment.

+++END OF SECTION 01350+++

SECTION 01351

PUBLIC OUTREACH (SMALL PROJECTS)

PART 1 - GENERAL

1.01 SCOPE

Public outreach related to the Project shall be directed and led by the **County's** DWM Public Outreach Office (DWMPOO), through a public communications and outreach specialist (PCOS) assigned by the **County**. The **Contractor** shall assist and support the **County's** PCOS by ensuring that a nominated **Contractor** employee is available and trained to support the outreach efforts as specified herein.

1.02 STAFFING

- A. The **Contractor** shall designate a public outreach contact (POC) on the construction crew to continuously coordinate and provide information regarding customer service issues at the project site to the **County's** construction manager, who will notify DWMPOO and PCOS.
 - 1. The POC shall have responsibility for coordinating with the PCOS in receiving, logging, tracking, responding, and resolving customer/citizen complaints and Claims, providing notices to and personal interaction with affected customers/citizens at the site regarding project impact and projected work schedules.
 - 2. The POC shall have the responsibility of reporting to the PCOS any unforeseen construction incidents with the potential to impact community quality of life and updating and coordinating with PCOS to implement appropriate responses and/or, notifications to and personal interactions with affected customers/citizens.
 - 3. The POC shall participate in an orientation session presented by DWMPOO focusing on established protocols and procedures for conducting on-site public outreach activities during construction.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 PUBLIC INFORMATION KICK-OFF MEETING (AT DWM DISCRETION)

- A. Prior to commencement of Work under the Contract and following the preconstruction meeting, the **Contractor**, the PCOS, and the **County** shall attend a meeting hosted by the DWM project manager (PM) or construction manager (CM). At this meeting, the **Contractor's** responsibilities and the relationship with the DWMPOO and PCOS and the functions and responsibilities of the POC employed by the **Contractor**, according to Section 1.02 A, will be discussed. The **Contractor's** PCand backup individual(s) shall be identified to the DWM's call center, DWMPOO and PCOS, with 24/7 contact telephone numbers provided.

3.02 RESPONSIBILITIES OF THE POC

- A. The duties of the **Contractor's** POC shall be as defined below and may be expanded by the **County's** construction manager.
1. Coordinating with PCOS for the logging, tracking, and resolving customer/citizen complaints and Claims, when received by the **Contractor**, and providing periodic updates and reports as specified.
 2. Working with PCOS to develop and implement a plan for 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 that shall have an impact on the neighborhood or property owners, and executing the plan once approved by DWMPOO.
 3. Attending and participating in scheduled Project progress meetings for discussion, updates, review of complaints log and potential resolution to customer/citizen complaints, Claims, review of schedules, and other matters, as required.
 4. Planning, attending and participating in periodic public meetings and working with the DWMPOO to promote and prepare necessary Project information in advance of these meetings.

In the event Work is required on private property where an easement has been acquired, the POC shall assist the PCOS in notifying the property owner at least fourteen (14) days in advance of commencement of the Work, in writing, with a copy provided to the DWMPOO. In no case will customers/citizens be contacted by **Contractor** without DWMPOO approval of both the communication plan and of any literature provided to customers/citizens.

Prior to commencement of work in neighborhoods, the POC shall work with the PCOS to notify the customers/citizens fourteen (14) to thirty (30) days in advance. In no case will customers/citizens be contacted by **Contractor** without DWMPOO approval of both the communication plan and of literature provided to customers/citizens. In addition, 72 hours prior to actual commencement of the work, the PCO shall notify the customers/citizens via door hangers as hereinafter provided for in this Section. Such notices shall be coordinated with the **County's** Construction Manager and Public Outreach Office.

The PCOS shall be responsible for managing those notifications within the context of the Project schedule and the approved Project procedures, in coordination with the POC. The POC shall assist the **County** Site staff with the resolution of public outreach-related items that might delay or disrupt the Project work.

In the event the POC is away from Work, the **Contractor** shall designate a second individual, who shall be fully familiar and aware of the duties and prosecution of the Work, to handle the outreach coordination responsibilities and functions.

The POC shall assist the DWMPCOS in coordination of communications related to street closures, detours, and traffic pattern changes with the **Contractor's** field management staff, the **County's** construction manager, and the Department of Public Works or the GDOT.

In the event there is an emergency involving the public or a situation where media inquiries and responses are possible, the POC shall notify the **County's** DWMP COS immediately. The DWMP COS will then coordinate with the **County's** public relations/media relations manager for appropriate action. **Under no circumstance and at no time shall the Contractor or any of its employees, Subcontractors or vendors of the Contractor make comments to the media regarding the Project.**

3.03 ISSUES MANAGEMENT TRACKING

- A The **County** shall develop, implement, and maintain an organized and comprehensive issues management strategy for tracking customer/citizen complaints, Claims, and inquiries. Related information shall be updated on a daily basis by the PCOS with input from the **Contractor's** POC. Tracking information and responses shall be coordinated with the DWMP OO.
- 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 two (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

In no case will customers/citizens be contacted by **Contractor** without DWMP OO approval of both the communication plan and of literature provided to customers/citizens.

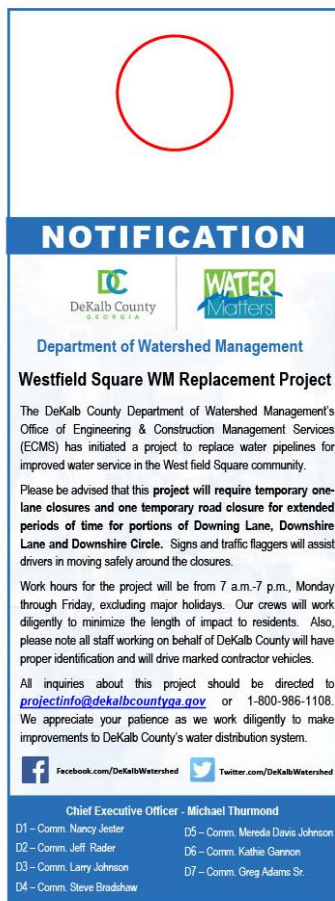
3.04 DOOR HANGERS

The **Contractor** shall produce door hangers required for notice to customers/citizens and residents from the template provided by the **County's** DWMPPOO (see example at the end of this Section) as specified above in paragraph 3.02. Door hangers shall be utilized for notification in event of, but not limited to, the following events:

- A. Planned service disruption/outages
- B. Road closures/detours/traffic pattern changes
- C. Access/entrance to property
- D. Work startup
- E. Smoke testing
- F. Blasting

The DWMPPOS shall be notified twenty-four (24) hours in advance of any door hanging activity by the **Contractor**.

Sample 1. Door Hanger



3.05 IMPACTED AREA ADDRESS DATABASE

- A. The **Contractor** shall provide the DWMP COS with a database of addresses and phone numbers (and names if available) of Project-affected residences, businesses, and facilities at least three (3) weeks prior to Project startup. The database will be used by the DWMP OO for regular citizen communications and notifications.
- B. The **Contractor** shall copy the DWMP COS on correspondence and Right-of-Entry Agreements with citizens and property owners.

3.06 SCHEDULE

- A. The **Contractor** shall provide the DWMP COS with a copy of the detailed Project schedule following approval by the **County**.
- B. Biweekly, the **Contractor** shall provide a list of properties:
 - 1. That shall be affected by the **Contractor's** activities within the upcoming four (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 PCOS through the weekly progress meetings and in writing of Project schedule changes or changes in disruptive work, such as blasting and road closures that would have significant impact on citizens or require prior citizen notification.

3.07 MEDIA RELATIONS AND JOB SITE INQUIRIES

- A. As specified above in paragraph 3.01, only authorized persons with the **County** shall release information in response to media inquiries. The **Contractor's** field personnel shall keep Project information cards available that shall be provided to media and citizens if inquiries are made onsite. Media and citizen inquiries shall be directed to the DWPCOS via the Project information email or phone line.
- B. Project information cards shall be produced from the template provided by the public outreach team.

3.08 NOTIFICATIONS

The **Contractor** shall provide the following notifications to the DWMP OO to facilitate its communication with affected citizens through hand-distributed flyers or mailers:

- A. Anticipated work start date – notify at least four (4) weeks prior to start of construction so that DWMP COS can send out mailers or door hangers two (2) weeks prior and/or distribute notification letters seventy-two (72) hours before construction begins.
- B. Service disruptions - notify DWMP COS at least two (2) weeks in advance so that door hangers can be produced and distributed at least seventy-two (72) hours prior to the start of disruption.

- C. Full Road Closure - notify DWMP COS at least three (3) weeks in advance so that door hangers or notification letters can be produced and distributed at least seventy-two (72) hours prior to the start of closure, preferably two (2) weeks before closure goes into effect.
- D. Significant work in a neighborhood: Blasting, directional drilling, trenchless installation, and open cut shall require letter or door hanger notification of the DWMP COS at least seventy-two (72) hours in advance.
- E. The **Contractor** shall provide the following door hanger notifications and the personnel to deliver them, at a minimum:
 - 1. Service disruptions: notice to citizens seventy-two (72) hours prior to disruption.
 - 2. Full street or partial closure: Notify fire, police, other emergency services, and other authorities seventy-two (72) hours prior to street closure, preferably two (2) weeks in advance for full closure.
 - 3. Significant work in neighborhoods: such as Blasting, directional drilling, and trenchless installation, or open cut, etc.: Notify citizens via door hangers or letters seventy-two (72) hours in advance.
- F. The **Contractor** shall be fully responsible for notification to emergency-related services for detours, closures (partial or full) or traffic pattern changes and shall be detailed in their traffic control plan and implemented through the **Contractor's** traffic control manager and per permitting requirements.
- G. The **Contractor** shall be fully responsible for distributing notifications a minimum of seventy-two (72) hours in advance of service outages for schools, nursing homes, hospitals, medical clinics, assisted living facilities, or other types of facilities. **Contractor** shall make personal contact with facility representatives no later than sixty (60) minutes prior to the outage.
- H. The **Contractor** shall at all times coordinate with the DWMP COS and call center to provide detailed schedules and street locations for service disruptions or street closures to verify that DWM customer service call center is well equipped to provide adequate response to citizen inquiries.

3.09 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, shall result in resolution of the complaint or Claim by the **County**. The **Contractor** shall be charged for the associated cost in accordance with the applicable General Requirements of the contract. No additional payment shall be made to the **Contractor** for costs associated with complaint or Claim resolution, same being incidental to the various contract items that are Bid. Failure to manage the issues and items adequately to minimize public complaints and impacts shall be cause for increasing the retainage, withholding payment, or notice and termination of the **Contractor** for cause when more than ten (10) percent of the noticed complaints or Claims past thirty (30) days are without decisive resolution and scheduling of recovery Work.

END OF SECTION

SECTION 01380

PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

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

The **Contractor** shall submit monthly color progress photos along the entire line of the active Work site. Monthly record progress photographs shall be submitted with monthly payment requisition. Photographs shall document construction within roadways, rights-of-way, and easements,

The **Contractor** shall engage the services of an experienced professional photographer, approved by the **County**, to take videos, color photographs of the site as directed by the **County**.

1.02 PROCEDURES

- A. The digital video recording 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 adequately document areas of sensitivity such as landscaped areas, lake or stream banks, or areas surrounding existing structures.
- C. Each photograph, video, or digital file of such submitted shall be dated, identified, and captioned, referencing the location, project name, project number, and pertinent information to clearly describe the scene.
- D. Recording shall be done with adequate lighting. Written authorization by the **County** to proceed with video documentation at any areas shall be done with consideration of existing environmental conditions. The designee of the **County** will accompany the photographer during the video and photo sessions.
- E. **Contractor** shall notify **County** of the time and place for video recording and digital photography. **Contractor** shall provide access and accommodation to the **County** representative during the photographic documentation process. The **County** reserves the right to reject any photograph that is not clear or definitive. Any photograph so rejected shall be subtracted from the total exposures required under this Contract.

- F. The daily construction photographs shall be the permanent visual record of the pre-construction conditions, daily construction site activities, and the completion of construction Work. The **Contractor** shall submit to the **County** no fewer than four record photos for each activity ID listed in the project schedule per the last schedule update. Applicable photos shall accompany each Pay Application.

1.03 VIDEOS

- A. The project corridor shall be documented by digital video recordings.
- B. All digital video recordings shall be in color and shot with a 1080 HD (1920 x 1080) using MPEG-4 program stream encoding (ISO-IEC 14496-14) camera and shall be a clear, stable image with no interference. Black and white recordings shall not be accepted. The video shall be provided on Digital Video Discs (DVDs) or USB Flash Drives and shall conform to currently recognized standards for video recordings. Specifically, the recordings shall be in focus and properly illuminated with good contrast. The picture shall 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, including stationing along pipeline construction, and is in synchronization with the video. The recording shall bear a continuous "date and time stamp" that is electronically recorded by the camera.
- C. A record of the contents of each recording shall be provided on a run sheet, identifying each chapter segment of the recording. The run sheet shall be provided in paper copy as well as on the flash drive or hard drive.

1.04 PHOTOGRAPHS

- A. The file format for digital photographs shall be Tagged Image File Format (TIFF).
- B. Digital cameras shall produce records with true optical resolution. Images shall not be resized or interpolated to a higher resolution from a lower resolution.
- C. Photographic images shall be provided as 8 bit per channel RGB color images.
- D. Digital camera files shall be captured as 12 megapixel files or greater in size with a minimum pixel array of 5,000 pixels by 3,500 pixels.
- E. Three color 8" x 10" (or 8-1/2" x 11") glossy prints of each photograph shall be produced. One set of digital images shall be furnished on a DVD along with the glossy prints. All disks shall have a label that includes project information as well as the date, and whether these are pre-construction, construction, or post-construction photographs.
- F. The prints shall have indelibly printed on their reverse side the information listed below. The same information shall be printed on a sheet of paper in a clear sleeve to be included in the binder holding the prints and DVD+R. The information shall also be provided in a Microsoft Excel spreadsheet that shall be included on the DVD. Additionally, this information shall be embedded in each digital photo file

using the IPTC/XMP (International Press Telecommunications Council's/Adobe Extensible Metadata Platform) Standard.

1. Project number
 2. Project name
 3. Contract number and description
 4. Photo number
 5. View and description, indicating:
 - a. Location of camera
 - b. General description of what the photograph represents
 6. Whether this is a pre-construction, construction or post-construction photograph
 7. Date picture was taken
 8. Name of photographer
 9. **County** witness
- G. The **Contractor** shall transmit one electronic copy of each photo to the Engineer for use in preparing descriptions. The photos with descriptions will be returned to the **Contractor** for printing and mounting.
- H. The prints shall be suitably mounted and labeled in loose-leaf type binders with protective covers for the prints. The binders shall be equipped with a pocket suitable for storing the DVDs. The materials shall meet the requirements of ISO 18902:2013 "Imaging materials - Processed Imaging Materials – Albums, Framing and Storage Materials."

1.05 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 shall be assembled upon completion of the Project and shall be furnished to the **County** for approval prior to submittal of the final request for payment. No pay requests shall be processed before the submittal of the respective video records.
- B. **Contractor** shall utilize **County** SharePoint Software to submit videos and progress photographs in electronic format for the duration of the project in accordance with Section 01350.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 USE OF PHOTOGRAPHS AND VIDEOS

- A. Upon their creation, the photographs, prints, DVDs, and videos resulting from the

Work under this Contract shall become the exclusive property of the **County**.

- B. Neither the **Contractor** nor the photographer nor the video recording firm shall retain any rights pertaining to the photographs, prints, CDs/DVDs, or videos, nor shall they reproduce or otherwise publish or disseminate any of the photographs, aerials, prints, CDs/DVDs, or videos taken under this Contract without the prior written approval of the **County**.
- C. The photographs, prints, CDs/DVDs, and videos shall be considered "Work made for hire" under applicable provisions of the Copyright Act, and the **County** shall be the copyright owner thereof and of the aspects, elements, and components thereof in which copyright protection might subsist. To the extent that such materials do not qualify as "Work made for hire," the **Contractor** hereby irrevocably transfers, assigns, and conveys exclusive copyright ownership in and to such materials to the **County**, free and clear of any liens, claims, or other encumbrances. The agreements between the **Contractor** and the photographer and videotaping firm shall include a provision containing these requirements.

+++END OF SECTION 01380+++

SECTION 01400 Contractor's Work Quality

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. **Contractor's** Quality Assurance / Quality Control Requirements
- B. Experience and Qualifications of Supply and Service Companies
- C. Quality of Materials, Equipment, and Work
- D. Defective Work, Equipment, or Materials
- E. Welding Certification and Welding Inspection
- F. **Contractor's** Surveyor
- G. Field Measurements

1.02 PAYMENT

No separate payment shall be made for performing any Work of this Section and costs thereof shall be deemed incidental to the Work and included in the prices bid for the Contract, unless otherwise specified in the Detailed Specifications.

1.03 RELATED SECTIONS

Detailed Specification 01410.

1.04 DESCRIPTION

- A. Experience and Qualifications of Supply and Service Companies: The **Contractor** shall require subcontractors, materialmen, and equipment service providers to comply with the accepted Health, Safety & Security Plan, and Quality Assurance requirements under the Contract.
- B. Quality of Materials, Equipment and Work
 - 1. All materials, fixtures, fittings, supplies, and equipment furnished under this Contract shall be new, of standard first grade quality, of the best workmanship, correctly designed, and be intended for the use for which they are offered. Materials or equipment that, in the opinion of the **County**, are inferior or of a lower grade than indicated, specified or required, or are obsolete, shall not be accepted.
 - 2. All Work of assembly, installation, and construction shall be done in a neat, first-class, and skillful manner. If the quality of the material, fixtures, fittings, supplies, equipment or Work required by the Drawings does not agree with that required by the Specifications, the better quality shall be supplied. In asking for prices on, or placing orders for, materials, fixtures, fittings, supplies, and equipment intended for use or installation under this Contract, the **Contractor** shall provide the manufacturer or dealer

with such complete information from these Specifications as may in any case be necessary. In every case, it shall quote in full to each such manufacturer or dealer the text of this subparagraph, as well as the text of such other portions of the Specifications, as are appropriate.

3. At all times while Work under this Contract is being performed, the **County** shall have access to all parts of the **Contractor's** or manufacturers' plants or other locations where the forgings, plates, materials, fixtures, fittings, supplies, or any other articles required under this Contract are manufactured, assembled, tested, or inspected. The **County** shall be permitted to witness any or all of these operations, as the **County** may deem necessary to determine that the Work is being performed in accordance with the Specifications and the approved shop drawings. The cost, if any, of providing such access shall be considered part of the normal expense of conducting business and therefore non-reimbursable.
4. The **County** shall be furnished with full facilities for inspecting the Work and ascertaining that it is being done strictly in accordance with the requirements of the Specifications, Drawings, and the intent of this Contract.
5. The **Contractor** shall provide a suitable space for the **County** and the **County's** authorized representatives conveniently located near that part of each plant where materials or equipment to be furnished under this Contract are being manufactured, assembled, or shop tested. Each space shall be furnished with facilities for the making and the keeping of records and correspondence. The reasonable use of a photocopier, telephone, and fax shall be provided, as required by the **County**. Long distance communications shall be made using **County** mobile telephones at no cost to the **Contractor**.
6. The **Contractor** shall give notice in writing to the **County** sufficiently in advance of its intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction in the event that the **County** intends to perform Witness Shop Testing and Quality Assurance Inspection. Such notice shall contain the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the **County** will: decide upon its intent to inspect the Work or notify the **Contractor** that inspection will be waived. In those instances where the **County** inspector(s) arrive at the agreed-upon location, at the agreed-upon date and time, and find that the article(s) to be inspected are not ready for inspection, the inspector(s) shall return to their home office and the expenses incurred shall be borne by the **Contractor** and shall

be deducted from the **Contractor's** next payment, unless otherwise determined by **County**.

7. Inspection of the Work by the **County** is made solely for the benefit of the **County**. The inspection of the Work shall not relieve the **Contractor** of any of its obligations to fulfill the Contract as herein prescribed, and defective Work shall be repaired or replaced at the **Contractor's** sole expense.

C. Defective Work, Equipment, or Materials

1. All defective or imperfect Work, equipment, or materials furnished by the **Contractor** that is discovered before the Final Acceptance of the Work, or during a warranty period, shall be removed immediately even though it may have been overlooked by the **County** and approved for payment. The **Contractor** shall repair such defect, without compensation, in a manner satisfactory to the **County**.
2. Unsuitable materials and equipment shall be rejected, notwithstanding that such defective Work, materials, and equipment may have been previously overlooked by the **County** and accepted or approved for payment.
3. If any workmanship, materials, or equipment are rejected by the **County** as unsuitable or not in conformity with the Specifications or Drawings, the **Contractor** shall promptly replace such materials and equipment with acceptable materials and equipment at no additional cost to the **County**. Equipment or materials rejected by the **County** shall be tagged as such and shall be immediately removed from the site.
4. The **County** may order tests of imperfect or damaged Work equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the **Contractor**, and the nature, tester, extent, and supervision of the tests shall be as determined by the **County**. If the results of the tests indicate that the required functional capability of the Work, equipment, or material was not impaired, the Work, equipment, or materials may be deemed acceptable, in the discretion of the **County**. If the results of such tests reveal that the required functional capability of the questionable Work, equipment, or materials has been impaired, then such Work, equipment, or materials shall be deemed imperfect and shall be replaced. The **Contractor** may elect to replace the imperfect Work, equipment, or material instead of performing the tests.
5. If, in the making of any test, it is ascertained by the **County** that the material or equipment does not comply with the Contract, the **Contractor** will be notified thereof, and it will be directed to refrain from delivering said material or equipment, or to promptly remove it from the site or from the Work and replace it with acceptable material without cost to the **County**. Upon rejection of any

material or equipment submitted as the equivalent of that specifically named in the Contract, the **Contractor** shall immediately proceed to furnish the named material or equipment.

D. Welding Certification and Welding Inspection

1. For Work performed within the limits of the **County**, field welding required under this Contract shall be performed by certified welders:
 - a. Certification for Welding – For field and shop welding, the following welding qualification provisions shall apply:
 - i. For field welding, required permits and safety plans shall be in place and adhered to.
 - ii. For shop welding: welding shall be performed in accordance with the relevant Work-specific requirements in the Specifications and Drawings.
 - iii. If existing certification is not approved or not submitted, then the welders/welding shop/tack welders shall be qualified in accordance with the above procedures and tests, as administered by an inspection agency approved by the **County**. The costs associated with the required tests for certification and/or retests, if any, shall be borne by the **Contractor**. The **County** shall be given a notice of not less than 5 business days prior to such tests and may elect to witness any or all of these tests. The costs associated with witnessing these tests shall be borne by the **Contractor**.
 - b. Any deviation from the above shall not be permitted without a written waiver from the **County** or its designee.
2. All welding, including welder certification, shall be performed in accordance with the requirements of AWS D1, ASME IX (and the applicable construction code), and as approved by the **County**.
3. Welding inspection shall be in accordance with the latest rules of the American Welding Society, and the following shall apply:
 - a. All welds shall be inspected visually in accordance with Section V of the ASME Code.
 - b. All stainless steel partial penetration groove welds shall be inspected and approved by means of Liquid Penetrant Examination (PT) in accordance with Appendix 8 of Section VIII, Division 1 of the ASME Code. Welds failing the inspection shall be made good and re-inspected by PT.
 - c. All carbon steel partial penetration groove welds shall be inspected and approved by means of Magnetic Particle Examination (MT) in accordance with Appendix 6 of Section VIII, Division 1, of the ASME Code. Welds failing

the inspection shall be made good and re-inspected by MT.

- d. On full penetration welds, both the root pass and the final weldment shall be inspected by means of MT or PT as applicable.
- e. Unless otherwise approved, inspection of welds shall be conducted by an inspection agency approved by the **County**.
- f. Unless waived by the **County**, full-penetration welds shall be inspected by Radiographic Examination (RT) in accordance with ASME Code, Section VIII, Division I, Paragraph UW-51.
- g. The **County** may elect to witness any or all of the welding inspection. Notice shall be given to the **County** not less than 5 business days prior to welding and inspection of those items specifically designated by the **County**. The costs associated with the welding inspection by the **County** inspectors and any additional testing required by the **County** shall be borne by the **Contractor**.

E. **Contractor's Surveyor**

- 1. The **Contractor** shall retain the services of a licensed land surveyor to perform survey Work, including, but not limited to, establishing line and grade, in advance of the construction; and to perform other surveying services for the Work included under the Contract. The surveyor shall be subject to the approval of the **County**. Survey drawings shall be submitted to the **County** for approval.
- 2. The **Contractor** shall erect, install, and maintain survey platforms, targets, benchmarks, and similar facilities to be used by the **County** in the performance of its inspection services; and shall perform survey Work required before, during, and after construction.

F. **Field Measurements**

- 1. The **Contractor** shall take the necessary measurements in the field to determine the exact dimensions for Work and verify pertinent data and dimensions shown on the Contract Drawings.

1.05 **QUALITY ASSURANCE / QUALITY CONTROL PLAN**

- A. The **Contractor** shall establish and execute a Quality Assurance/Quality Control (QA/QC) Plan for the services and equipment that will be supplied under this Contract. The plan shall provide the **Contractor** with adequate measures for verification and conformance to defined requirements by its personnel and subcontractors, fabricators, suppliers, and vendors. The **County's** review and acceptance of the **Contractor's** QA/QC plan shall not relieve the **Contractor** from any of its obligations for the performance

of the Work. The **Contractor's** assigned QA/QC personnel are subject to the **County's** review and continued acceptance. No Work covered by the QA/QC plan shall start until the **County's** written acceptance of the **Contractor's** QA/QC plan has been obtained.

- B. The **Contractor's** quality control organization with lines of authority and reporting structure. The Construction Quality staffing shall include a Construction Quality Manager and a supporting staff as applicable to the project. The reporting structure shall clearly provide for direct reporting access by the Construction Quality Manager to the **Contractor's** principal officers.
- C. The names, qualifications (in resume format), duties, responsibilities, and authorities of the Construction Quality Manager and staff. Construction Quality personnel qualifications (in resume form), including copies of each member's applicable certificates of training and/or qualification.
- D. A copy of a letter to the Construction Quality Manager signed by a principal officer of the **Contractor's** firm that describes the responsibilities of the Construction Quality Manager and establishes his/her authority, including authority to stop Work that does not conform with the Contract Documents. The Construction Quality Manager shall issue letters of direction to other Construction Quality staff outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the CIP PMT and CM.
- E. A copy of a letter to the Construction Quality Manager signed by a principal officer of the **Contractor's** firm that describes the responsibilities of the Construction Quality Manager and establishes his/her authority, including authority to stop Work that does not conform with the Contract Documents. The Construction Quality Manager shall issue letters of direction to other Construction Quality staff outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the CIP PMT and CM.

1.06 SUBMITTALS

- A. Within 15 days after the commence Work date given in the Notice to Proceed (NTP), the **Contractor** shall provide its QA/QC plan to the **County** for approval. At a minimum, the plan shall consist of the following quality elements:
 - 1. Responsibilities
 - 2. Management and Production Instructions
 - 3. Material Control
 - 4. Marking and Material Identification
 - 5. Setup and Operational Procedures
 - 6. Non-Conformances

7. Painting
- B. Additionally, when required by the **County**, the **Contractor** shall submit the following information prior to his entering into a supply or service subcontracts:
1. Contract number, supplies or services to be provided and a general description of the proposed item(s), such as trade name, type, etc.
 2. The name and address of the manufacturer or service company and the location of the plant where supplies will be manufactured and tested as required, or at which the services will be performed.
 3. Experimental and test data required to support the claimed performance of the supplies.
 4. A description of the testing plant, including the hydraulic, electrical and other facilities, in sufficient detail to show that the plant is adequately equipped for performing the tests, if such testing is required.
 5. All additional information that the **County** may deem necessary in order to determine the ability of the supply or service company to produce the item as called for by the Specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

1.01 Quality Deficiency and Non-Conformance Documentation

Quality Deficiencies and Non-Conformances are defined as documentation, drawings, material, and equipment or Work not conforming to the specified requirements or procedures. The **County** will implement and maintain a three-tier non-conformance process, as follows:

- A. Deficiency Notice (DN) – The lowest level of non-conformance reporting. It documents the deficient condition and provides the **Contractor** 72 hours, or before the Work is covered, to correct the issue before it is elevated to the next level of reporting. It is issued for deficiencies that can be easily corrected without an engineering resolution. An example would be incorrect formwork dimensions observed prior to placement of concrete.
- B. Non-Conformance Report (NCR) - The second level is an NCR that documents deficient Work that has not been corrected, or that would require an engineering solution to remedy. NCRs shall be answered in writing by the **Contractor** within 24 hours. The **Contractor** shall not be allowed to progress items for payment if it has open NCRs.
- C. Corrective Action Request (CAR) – The highest level of non-compliant reporting. CARs are issued for programmatic and repetitive non-compliant conditions. Examples of CARs would be using the wrong drawing revision in the field (programmatic) and a condition where the same type of Work has multiple NCR

issues over a short period of time (repetitive). CARs cannot be answered by the **Contractor** field staff. They shall be transmitted to the **Contractor's** senior level management for response.

+++END OF SECTION 01400+++

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 described, however if the **County** decides that testing is required to demonstrate compliance with specified material or performance standards, the **County** shall 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 International, other recognized authorities and as specified.
 - 2. Ascertain compliance with requirements of Contract Documents.
- D. Promptly notify the **County** and **Contractor** of irregularity or deficiency of Work that is observed during performance of services.

- E. Promptly submit three copies (two copies to **County** and one copy to **Contractor**) of report of inspections and tests in addition to those additional copies required by the **Contractor**, including:
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 shall not be authorized to:
1. Release, revoke, alter, or enlarge on 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 downtime 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:
1. To provide access to Work to be tested
 2. To obtain and handle samples at the site
 3. To 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 inspection and testing are to be conducted by an independent laboratory agency, the sample or samples shall be selected by such laboratory or agency or the **County** and shipped to the laboratory by the **Contractor** at **Contractor's** expense.
- G. Copies of the 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 ASTM International.

1.05 PRODUCT HANDLING

Promptly process and distribute all required copies of test reports and related instructions to insure 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 onsite to provide the required testing.
2. Provide all required time within the construction schedule.

B. When changes of 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 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 of the laboratory cured samples shall be tested at 7 days, two samples tested at 28 days; one sample 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 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 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 shall 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

SECTION 01540 SECURITY AND SAFETY

Part 1 - GENERAL

1.01 SECURITY PROGRAM

- A. The **Contractor** shall protect the Work, including 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 Work site that provides adequate security for material stored and installed onsite.
- C. The **Contractor** shall maintain the security program throughout the Contract duration.
- D. The **Contractor** and subcontractors shall be wholly responsible for the security of its storage compound and laydown areas, and for plant, material, equipment, and tools at 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 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. See the end of this Section.
- E. The **Contractor** shall require each employee to sign the Employee Acknowledgment of Project Site Rules Log included at the end of this Section. 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, or 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 is 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** shall be held responsible for 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 the **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

The **Contractor** shall not allow cameras on site or photographs taken without approval of the **County**, except as required under Section 01380.

1.05 CONTRACTOR SAFETY/HEALTH AND SECURITY PLAN

- A. Within 30 days of Notice To Proceed, and prior to the performance of any Work, the **Contractor** shall prepare and submit a Contract-specific Health, Safety, 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** Health, Safety, and Security Plan for the adequacy of the plan. The plan shall:
 - 1. Identify the person(s) responsible for implementation and enforcement of Health, Safety, and Security rules and regulations for this Project.
 - 2. Address safe Work procedures for the activities within the **Contractor's** scope of Work.
 - 3. Include a new employee orientation program to address job- and site-specific rules, regulations, and hazards.
 - 4. Include the **Contractor's** Drug-Free Work Place Policy describing the substance abuse prevention and testing program.
 - 5. Include provisions to protect the **Contractor's** employees, other persons, and organizations possibly affected by the Work from injury, damage, or loss.
 - 6. Comply with current Fed/OSHA regulations; the Health, Safety, and Security Plan; the 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 the plan, plus accidents, and investigation reports.

11. Address other contract-specific requirements, including the Unique Requirements of these specifications.
- C. Prior to the start of Work, **Contractor** shall provide Job Safety Analyses (JSAs) for unique Work activities necessary to prosecute the scope of Work.
- D. Review of the **Contractor's** Health, Safety, and Security 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 safety reports, training records, competent person list, and accident reports prepared in compliance with Fed/OSHA and the Project Health, Safety, 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 other personnel at the Work site. The **Contractor** shall identify a Project Safety Coordinator (PSA) on the job with an appropriate office on the job site to maintain and keep available safety records and up-to-date copies of pertinent safety rules and regulations.
- B. The Project Safety Coordinator shall:
 1. Comply with applicable health and safety requirements of governing legislation.
 2. Schedule and conduct safety meetings and safety training programs as required by law and included in the **Contractor** Health, Safety, and Security Plan for personnel engaged in the Work.
 3. Post appropriate notices regarding safety and health regulations at locations that afford maximum exposure to personnel at the job site.
 4. Post the name(s), address and hours of the nearest medical doctor(s), 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 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 preservers, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, explosion meters; and other equipment mandated by law.
 7. Inspect each Work crew at least once daily in accordance with an Inspection Checklist Report Form to make sure that workers are wearing their appropriate personal safety equipment; machines, tools, and equipment are in safe operating condition; Work methods are not dangerous; and the Work

site and Work methods are free of hazards.

8. Submit to the **County**, upon request, copies of inspection checklist report forms; safety records, safety inspection reports, and certifications from regulating agencies and insurance companies.
9. Immediately notify the **County** of a serious accident, followed by a detailed written report within 24 hours. "Serious accident" is defined as that requiring an absence of Work of more than two days and/or hospitalization.
10. Immediately notify the **County** in the event of a fatal accident.
11. Immediately notify the **County** of any accident claim against the **Contractor** or any subcontractor, followed by a detailed written report on the claim, and its resolution.
12. Review safety aspects of the **Contractor's** submittals as applicable.

SECTION 01550 TRAFFIC REGULATION

PART 1 - GENERAL

1.01 SCOPE

The Work specified in this section includes the provision of products, permits, services, procedures, and personnel by the **Contractor** to effect traffic control during the Work.

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 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 24-hour basis to perform his or her duties. If the Work requires traffic control activities to be performed during the daylight and nighttime hours, it shall be necessary for the **Contractor** to designate an alternate TCM. An alternate TCM shall meet the same requirements and qualifications as the primary TCM and be accepted by the **County** prior to beginning any traffic control duties. The TCM's traffic control responsibilities shall have priority over 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, 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, Georgia Department of Transportation, etc.).
- B. The **Contractor** shall either fax or hand carry any 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 from the **County**.
- D. Operations between the hours of 6:00 p.m. and 10:00 p.m. and Saturdays, and Sundays shall require approval by the **County**.
- E. Full street closure permits shall require 96 hours' advance notice prior to road closure. The following additional information shall be provided by the **Contractor** prior to approval:
1. The recommended detour route with signage and Traffic Management Plan as per the MUTCD.
 2. A copy of the resident and/or business notification letters about the closure. The residents/businesses located between the detour routes shall be notified about the closure at least 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 Fire Chief, Chief of Police, DeKalb Hospital, MARTA, and the DeKalb County Board of Education shall be notified in writing at least 72 hours before commencing road closure activities.

Lane closure permits are issued during operating hours Mondays through Fridays. The DeKalb County Department of Public Works will return lane closure permit applications to the **Contractor**. The **Contractor** shall provide a minimum of 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.

3.02 PREPARATION OF TRAFFIC CONTROL PLANS

The Traffic Control Plan drawings included with the Contract Documents shall only be considered as a guide and are not intended to contain the traffic regulation details that shall 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: 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 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 highway 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 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 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 shall 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 shall be currently employed by a local jurisdiction, be in full uniform and have full arrest power while working.
- C. Officers shall be employed and paid by the **Contractor**.
- D. Officers' shall be responsible for directing traffic within the construction site.

3.06 FLAGMEN

The **Contractor** shall provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroaches into public traffic lanes.

3.07 FLASHING LIGHTS

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 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 materials and perform Work for the construction and maintenance of 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 the traffic plan from the **County**. The traffic plan shall 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 7 days prior to the first day of closure. Signs shall be acceptable to the **County**.
5. The **County** will handle emergency road closures.

3.10 PROCEDURES FOR TRAFFIC DETOUR ROUTE PLAN

- A. The **Contractor** shall provide a sketch map to the **County**, 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. The **Contractor** shall erect "Road Closed Ahead" signs before the start point of the detour indicating the name of the street closed.
- C. The **Contractor** shall erect "Detour" signs with appropriate directional arrows at 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. The **Contractor** shall erect an accessory plate indicating the name of the street being detoured to accompany each "Detour" and "End Detour" sign.
- F. The **Contractor** shall apply appropriate traffic control measures in accordance with the requirements of the MUTCD and **County** codes.

3.10 BARRICADES AND WARNING SIGNS

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

3.11 REMOVAL

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. The **Contractor** shall use the latest version of the manufacturer's product line of installed materials and equipment at the time of purchase. The **Contractor** shall not purchase materials and equipment that have been outdated by newer versions at the time of purchasing. Materials and equipment that show any signs of extended storage such as corrosion, scratches, and dents shall not be accepted.
- B. The **Contractor** shall use equipment for performing the Work that conforms to the latest version of applicable safety standards including, but not limited to, OSHA requirements. **Contractor** shall not exceed or ignore any requirements or recommendations of the equipment manufacturer. Equipment not meeting requirements of this Section shall be barred from use on the project.
- C. The **Contractor** shall install material and equipment that meets or exceeds 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. The **Contractor** shall use anchor bolts that are 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 where they are used.
- B. The **Contractor** shall use anchor bolts 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 carrying 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 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 of not less than the following values in concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
1/2	4,500	6,300
5/8	6,900	7,700
3/4	10,500	9,900

- 3. Embedment depth shall be minimum 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 other applications, provide ANSI Type 316 steel expansion anchors from one of the following manufacturers:
 - a. Hilti, Incorporated
 - b. Ramset, Incorporated
 - c. Approved equal
- 3. Install anchors per manufacturer's recommendations and this Section

Drilled anchorage holes are to be blown out 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 International 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. Threads shall be clean cut and shall conform to ANSI Standard B1.1-1989 for Unified Inch Screw Threads (UN and UNR Thread Form).

2.03 CONCRETE INSERTS

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 permits adjustment of the hangers both horizontally (in one plane) and vertically and locking of the hanger head or nut. 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, 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. 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

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

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 that will permit easy removal for servicing the equipment. The guards shall conform to applicable safety codes and regulations.

2.07 NAMEPLATES

- A. The **Contractor** shall provide each piece of equipment, with the exception of the items mentioned below, 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 noncorrodible 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

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

2.09 PROTECTION AGAINST ELECTROLYSIS

Where dissimilar metals are used in conjunction with each other, the **Contractor** shall provide suitable insulation between adjoining surfaces 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 shall 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 give 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 shall 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 out of dismantling, inspection, repair, and reassembly.
- C. Storage and Protection:
1. During the interval between the 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 protect against equipment deterioration. Manufacturer's recommendations shall be adhered to in addition to these requirements.
 2. Equipment and materials to be located outdoors may be stored outdoors if protected against moisture condensation and ultraviolet (UV) degradation. Equipment shall be stored at least 6 inches above ground. Temporary power shall be provided to energize 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 components of the system to enhance compatibility, ease of construction, and efficient maintenance. The **Contractor** shall be responsible to the **County** for performance of 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 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, as well as other Work and incidental items necessary or convenient to the **Contractor** for the satisfactory prosecution and completion of the Work.
- B. 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. 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 confirm 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. Openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.03 HANDLING

- A. 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 of size and capacity rating to safely support the weights of items to be unloaded. Slings and chains shall be regularly inspected and tagged as in good conditions in accord with OSHA requirements. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

+++END OF SECTION 01610+++

SECTION 01700 CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures
 - 2. Final completion procedures
 - 3. Warranties
 - 4. Final cleaning
 - 5. Repair of the Work
 - 6. Specific closeout and special cleaning requirements for the Work in those Sections

1.03 SUBMITTALS

Submit the following shop drawings in accordance with Section 01300:

- A. Product Data: For cleaning agents.
- B. **Contractor's** List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.
- D. Certificates of Release: From authorities having jurisdiction.
- E. Certificate of Insurance: For continuing coverage.
- F. Field Report: For pest control inspection.
- G. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.04 SUBSTANTIAL COMPLETION PROCEDURES

- A. **Contractor's** List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (**Contractor's** punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following: a minimum of (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting **County** unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Divisions 02 through 16 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Divisions 02 through 16 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the **County**. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain the signature of an authorized **County** representative for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit sustainable design submittals required in Division 01 (sustainable design requirements Section) and in individual Division 02 through 16 Sections.
 - 7. Submit changeover information related to **County's** occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following: a minimum of (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise the **County** of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver the keys to **County**. Advise the **County's** personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct **County's** personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section - Training.
 6. Advise **County** of changeover in heat and other utilities.
 7. Participate with **County** in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Remove labels that are not permanent labels.
 10. Complete final cleaning requirements, including touchup painting.
 11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, **County** will either proceed with inspection or notify **Contractor** of unfulfilled requirements. **County** will prepare the Certificate of Substantial Completion after inspection or will notify **Contractor** of items, either on **Contractor's** list or additional items identified by **County**, that shall be completed or corrected before certificate shall be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection shall form the basis of requirements for final completion.

1.05 STARTING OF SYSTEMS

- A. Conform to the requirements of sections within Division 1.
- B. Coordinate schedule for start-up of various equipment and systems.
- C. Notify **County** (seven) days prior to start-up of each item.
- D. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

- E. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- F. Verify wiring and support components for equipment are complete and tested.
- G. Execute start-up under supervision of applicable manufacturer's representative, **Contractors'** personnel, and **County** in accordance with manufacturers' instructions.
- H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, approve equipment or system installation prior to start-up, to supervise placing equipment or system in operation, and to train the **County's** staff.

1.06 DEMONSTRATION AND INSTRUCTIONS

- A. Not Used
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within (six) months.
- C. Utilize operation and maintenance manuals as the basis for instruction. Review contents of manual with **County's** personnel in detail to comprehensively explain the operation and maintenance.
- D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at a scheduled and agreed time, for each piece of equipment at each designated location. Time shall be acceptable to the **County**.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. Required instruction time for each item of equipment and system is specified in individual sections.

1.07 TESTING, ADJUSTING, AND BALANCING

- A. **County** shall appoint and employ services of independent firm to perform testing, adjusting, and balancing to ensure smooth and unhindered equipment operation. **Contractor** shall pay for services and funds shall be within the contract price.

Reports shall be submitted by independent firm to **County** indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.08 PROJECT RECORDS DOCUMENTS

- A. The **Contractor** shall record any actual revisions to the Work and maintain one set of the following Project Record Documents on Site:
 - 1. Contract Drawings, Specifications, and Addenda.

2. Change Orders, Field Orders, and other written notices.
 3. Shop drawings, Product data, and samples.
 4. Records of surveying and layout Work.
 5. Project Record Drawings.
- B. The **Contractor** shall record information on the Project Record Documents concurrent with construction progress and store these documents separately from the documents used for construction.
1. The **County** will supply a set of Contract Drawings. The **Contractor** shall mark thereon each revision as the Work progresses in order to produce a set of as-built drawings.
 2. The **Contractor** shall note any changes made during construction by any of the **Contractor's** forces or those of any subcontractors.
 3. The **Contractor** shall dimension the locations of buried or concealed Work, especially piping and conduit, with reference to exposed structures.
 4. The **Contractor** shall note the installed locations of concealed service lines on the Site or within the structure by reference from the center line of the service to the structure column lines, to other main finished faces, or to other structural points that are easily identified and located in the finished Work.
 5. Certificates of Substantial Performance and Total Performance shall not be issued until as-built drawings are complete and submitted, and the **Contractor** has fully satisfied the requirements for Substantial Performance and Total Performance of the Work.
- C. For Project Record Documents and Record Shop Drawings, the **Contractor** shall legibly mark each item to record actual construction, including:
1. Field changes of dimensions and details.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances that are concealed in construction, referenced to visible and accessible features of the Work.
 4. Any Changes in the Work from the contract documents.
 5. The location of concealed mechanical services and electrical main feeders, junction boxes, and pullboxes.
- D. Upon completion of the Work, the **Contractor** shall prepare two CD-ROM sets of the Record Shop Drawings and an index.

- E. The **Contractor**-prepared Record Shop Drawings CD-ROM index shall identify the **County's** project number, project name, and Contract number and the contents of each CD in the format listed below.
1. The index shall include the following columns of information for each Record Shop Drawing:
 - a. CD number
 - b. Specification Section number
 - c. Specification title
 - d. Shop drawing transmittal number
 - e. Shop drawing equipment description including preselected Equipment vendor and supplier.
 2. The index shall be printed by the following two sorts:
 - a. Primary sort: Specification Section number. Secondary sort: shop drawing transmittal number.
 - b. Primary sort: CD number. Secondary sort: Specification Section number.
 3. The index shall be generated using Microsoft Excel software. A copy of the electronic file shall be furnished to the **County**.
 4. The **Contractor** shall provide a set of Project Record Documents on CD-ROM in an electronic format compatible with the plant CD-ROM record standards. All drawings are to be provided electronically on CD-ROM in both AutoCAD (latest version) and Adobe Acrobat PDF (latest version). Also provide a set of CD-ROMs containing the software implemented on this project, including standard software and custom application software. Also provide a set of CD-ROMs containing the various programming tools and files necessary for maintenance, editing, backing up, and restoring programmable equipment implemented on this project.

1.09 EQUIPMENT INVENTORY SPREADSHEET

- A. As part of the **County's** asset management program, the **Contractor** shall complete each field for the equipment inventory file for each piece of equipment and device provided under this Contract, as a requirement for Substantial Performance. An electronic format of the equipment inventory spreadsheet shall be provided on a CD by the **Contractor**.

1.10 EQUIPMENT PREVENTIVE MAINTENANCE SPREADSHEET

- A. As part of the **County's** asset management program, the **Contractor** shall complete each field for each piece of equipment and device provided under this Contract, as a requirement for Substantial Completion. The **Contractor** shall transfer the

manufacturer's recommended preventive maintenance tasks and frequencies into the spreadsheet. An electronic format of the equipment inventory spreadsheet shall be provided on a CD by the **Contractor**.

1.11 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting them with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.12 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to location as directed by **County**; obtain receipt prior to final payment.
- C. Crate in containers designed for prolonged storage suitable for handling with hoisting equipment containers:
- D. Stencil on containers:
 - 1. Manufacturer/supplier name
 - 2. Unit name
 - 3. Spare part name
 - 4. Manufacturer catalog number
 - 5. Other identifying information
 - 6. Precautionary information

1.13 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1.
 2. Certified List of Incomplete Items: Submit certified copy of **County's** Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by **County's** representative. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of the request, the **County** will either proceed with inspection or notify the **Contractor** of unfulfilled requirements. The **County** will prepare a final Certificate for Payment after inspection or will notify the **Contractor** of construction that shall be completed or corrected before the certificate will be issued.
- C. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete has been completed or corrected.

1.14 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction, including, if necessary, areas disturbed by the **Contractor** that are outside the limits of construction.
1. Organize the list of spaces in sequential order, starting with exterior areas first, and proceeding from the lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name
 - b. Date
 - c. Name of **Contractor**
 - d. Page number
 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. **County** will return annotated file.
 - b. Three paper copies. **County** will return two copies.

1.15 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of the **County** for designated portions of the Work where commencement of warranties other than the date of Substantial Completion is indicated, or when a delay in submittal of warranties might limit the **County's** rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within fifteen (15) days of completion of designated portions of the Work that are completed and occupied or used by **County** during the construction period, by separate agreement with **Contractor**.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Contract Documents.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper or as directed by the **County**.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of **Contractor**.
 - 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the Georgia Code of Regulations maximum allowable volatile organic compound (VOC) levels.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: Perform final cleaning as directed by the **County**.
- B. Pest Control: Comply with pest control requirements in Division 01, Section, Temporary Facilities and Controls. Prepare and submit a written report to the **County**.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Division 1 and meet local laws.

3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determining Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration. Do not paint over "UL" or other required labels and identification, including mechanical and electrical nameplates. Remove any paint that has been applied to required labels and identification.
 - 3. Replace parts that have been subjected to operating conditions during construction that could impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

3.03 ADJUSTING

Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION - 01700

SECTION 01800 MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. **Contractor** shall maintain stored and installed equipment and materials until Final Acceptance of the Work as defined by the General Requirements. Work includes, but is not limited to:
1. Perform required maintenance.
 2. Repair and maintain protective coatings.
 3. Repair and replace scratched and damaged materials and equipment.
 4. Maintain and operate new equipment placed into service.
- B. Work, per this Section, starts on the date the equipment and materials are received and continues until the Date of Final Acceptance.
- C. **Contractor** shall monitor equipment storage, and subsequently, the operation and material functionality on a continual basis during the specified time period. Deterioration of materials or malfunction of equipment shall be followed by swift repair action to minimize the damage. Such repair shall include repair and technical services by an independent contractor if the **County** deems the **Contractor's** efforts are ineffective at correcting the problem.
- D. All costs for maintenance and repair of stored and installed equipment and materials, including costs from an independent contractor, during the specified time period shall be the sole responsibility of the **Contractor**.

+++END OF SECTION 01800+++

SECTION 02000 SITE WORK

PART 1 - GENERAL

1.01 DESCRIPTION

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 and all cost associated with the damaged utility are the **Contractor's** expense.
- B. Arrange for disconnection 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 in maintaining active services in operation.
- D. Locate, protect, and maintain benchmarks, monuments, control points, and project engineering reference points. Reestablish disturbed or destroyed items at the **Contractor's** expense.
- E. Perform site work operations and the removal of debris and waste materials to assure 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 cost associated with the damages including restoration of damaged items are at Contractor's expense.
- I. Protect and maintain streetlights, 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 maintain 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

Materials and equipment: As selected by the **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. Definitions:
 - i. 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 planned and controlled to excavate the rock to the required limits. Controlled blasting minimizes overbreak and fracturing of the rock beyond the design lines.
- C. The **Contractor**, in a lawful manner shall dispose of rock, off site, that is surplus or not approved by **DCDWM** as suitable for use as riprap or backfill.
- D. The **Contractor** shall exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. The **Contractor** shall provide a blaster certified licensed in the State of Georgia, and experienced workmen to perform blasting. The **Contractor** shall conduct blasting operations in accordance with all existing State and County ordinances and regulations and gain all required permits at their cost. The **Contractor** shall protect all buildings, structures and utilities from the effects of the blast. The **Contractor** is responsible for any damage due to the blasting and shall repair any resulting or associated damage at their cost.

1.02 GENERAL

- A. **No Blasting shall occur until the Contractor has received written approval from DCDWM. The Contractor shall notify DCDWM in writing the date, time of day of the first blast and the duration the blasting is to occur.** The **Contractor** shall notify the **DCDWM** and local fire department before any charge is set. 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. 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 and 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 short-range, high accuracy thunderstorm monitor and lightning warning system. System shall be constantly be monitoring the electrical field of the atmosphere for pre-emptive notification of nearby lightning strikes. The system shall connect to system lighting and audible devices to alert of incoming lightning activity. The system shall have the capability to send test messages and email alert notifications. The system shall have 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 (2) 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** shall employ an independent, qualified specialty subcontractor, to: monitor the blasting by use of a seismograph; identify the areas where charges shall be used; conduct pre-blast and post-blast inspections of structures, including photographs or videos; and maintain a detailed written log that may be reviewed by the **DCDWM**. The inspection corridor shall extend within a 500-foot radius of all proposed blasting operations. Two (2) copies of surveys, photographs, videos, reports, etc., shall be submitted to the **County**.

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 sixty (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 sixty (60) days prior to commencement of blasting operations, a Blasting Monitoring Plan that shall include:
 - a. Name of the Blasting Vibration Consultant who shall be responsible for establishing the monitoring program and interpreting the vibration readings;
 - b. Names of the trained personnel provided to operate the monitoring equipment; the type and model of blasting seismograph proposed for use;
 - c. Number and location of proposed monitoring stations; the methods to be used

- to coordinate blast detonation with recording of the blast; and
- d. Steps to be taken if blasting vibrations exceed or seem likely to exceed the vibration limits.
 - e. Name, make, and model of the short-range, high accuracy thunderstorm monitor and lightning warning system, including details on the alert warning system.
3. At least sixty (60) days prior to any blasting operation, provide:
- a. Initial blast design for that location including number, location, diameter, depth and inclination of drill holes on a scale drawing of the excavation or heading face;
 - b. Type and weight of explosive in each hole; delay arrangement showing delay period in each hole; total weight of explosive 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.
 - c. Manufacturers' data sheets shall be provided for all explosives and accessories to be used.
 - d. Name and qualifications of the independent preconstruction survey consultant.
 - e. Preconstruction Video Survey and Inspections.
 - f. Written controlled blasting techniques.
4. At least thirty (30) days prior to any blasting operation, provide Blasting Safety Plan including:
- a. Health and Safety requirements of all governing legislation;
 - b. Certificates from all regulating agencies and relevant insurance companies (**Contractor** shall allow sufficient time for Certificate of Insurance including Blasting Insurance and its endorsement should be submitted to P&C with time to be reviewed and approved by **County** Risk Management prior to blasting);
 - c. Outline of safety training program for the Contractor's and County's personnel;
 - d. Communication and warning procedures;
 - e. Samples of all report and inspection forms; and lightning protection plan.
5. Within the working day following each blast, the **Contractor** shall provide the blasting records and information for each blast detonated:
- 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

Work Experience:

- A. The blasting consultant shall have at least ten (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 two (2) days at any time that the blasting consultant's services may be necessary as determined by the **County**.
- B. Blasting supervisors shall have a minimum of five (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. Use only non-nitroglycerine explosives.
- B. Store explosives and detonators in the manufacturers' boxes with date codes to allow the County to determine their age of the materials. All explosives and detonators used in the work shall be less than one (1) year old. 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 two (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 (3) 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 fifty (50) feet of permanent concrete work may 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 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

SECTION 02050 DEMOLITION

PART 1 - GENERAL

1.01 SCOPE

A. General:

1. This section covers the labor, equipment, 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 removing structural tile and brick 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 that 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 his Health, Safety, and Security Plan. This information may be called for elsewhere in these Specifications, however a submittal is required.

C. Related Work Specified Elsewhere:

1. Section 01210 - Measurement and Payment
2. Section 02000 - Site Work
3. Section 02200 - Earthwork

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, shall 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
- B. Items not selected for salvage shall be legally disposed of at no additional cost to the **County**.

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 assuring 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 asbestos containing materials 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 as to create positive sheet runoff.
- B. Backfill material shall meet the minimum requirements of Section 02200 - Earthwork. Backfill compaction shall be in accordance with the applicable requirements of Section 02324 – Trenching and Trench Backfilling. 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 includes 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 01210 - Measurement and Payment
 - 2. Section 02200 - Earthwork
 - 3. Section 02324 - Trenching and Trench Backfilling
 - 4. Section 02920 - Site Restoration
 - 5. Section 03300 - Cast-In-Place Concrete

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and **Section 01300 - Submittals**.

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. AASHTO M147 - 65 - 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 – 00a - 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

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 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 ($\frac{1}{4}$) inch measured with a ten (10) foot metal straight edge.
- B. Scheduled Compacted Thickness: Within one-quarter ($\frac{1}{4}$) inch.
- C. Variation from True Elevation: Within one-half ($\frac{1}{2}$) inch.
- D. Base: Compacted to ninety-five (95) percent modified proctor density as determined by ASTM D1557.

END OF SECTION

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
 - 3. Section 02050, Demolition
 - 4. Section 02200, Earthwork
 - 5. Section 02231, Tree Protection and Trimming

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 existing improvements damaged by this work to their original condition, as acceptable to the **County** or property owner, as required. 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 shall be left standing.
2. Provide protection for tree roots over one and one-half (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 been 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**. A qualified arborist approved by the **County** shall perform tree damage repair at no cost to 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

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 twenty-one (21) 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 shall 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 one (1) inch shall be grubbed and removed to a depth not less than four (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 (2) feet below the limits of excavation for structures, trenches and roadway subgrade or two (2) 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 that 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 (6) inches loose-depth and compact to a ninety-five (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 forty-eight- (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 six- (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 shall not be acceptable. Specific gravity shall be two (2.0) or greater. Stones shall have less than sixty-six (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 shall be processed or disposed of in conformance with Federal, State, and local rules and regulations.
- D. The **Contractor** shall acquire any additional permits prior to commencement of any type of work done in the easement
- E. 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 shall 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 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 specified 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 requires the **Contractor** to design 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 storm water 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

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

The **Contractor** shall provide at least one (1) 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 shall 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 **County** 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 **County** may provide a reproducible drawing of plan sheets to the **Contractor** for **Contractor's** use if necessary. The reproducible drawing shall not bear the Design 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 shall minimize erosion and prevent the off-site transport of sediment in storm water and drainage from the jobsite areas.
- D. Submit a written plan to the **County** 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**:
 - i. 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 which 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 as temporary erosion and sediment control features, except the channel stabilization, gabions and grassing/sodding, trees, shrubs, and groundcovers, which are considered as 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 shall 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 one and one-half to three and one-half (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 approved equal.

B. CHANNEL STABILIZATION (RIPRAP) - Ch

- 1. Channel stabilization consists of structures to stabilize an open channel for water conveyance. Such stabilization is typically applied in those locations where the channel banks and bed have been disturbed by excavation for a pipeline crossing.
- 2. Channels shall be stabilized using a rock riprap lining. The lining shall consist of filter bedding stone and graded riprap 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.). Riprap stone shall be equal to Georgia Department of Transportation Type 1 or Type 3. Filter bedding stone shall be graded stone not exceeding six (6) inches in diameter. An appropriate geotextile fabric may be substituted for filter stone with **County** approval.

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 four to eight (4" to 8") inch pieces of durable stone. Stone placement shall be principally by hand or gentle mechanical dumping in no more than twelve (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 Maccaferri, USA or approved 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 two (2) year, twenty-four (24) hour frequency storm.

E. CHECK DAMS - Cd

1. Check dams are barriers composed of stone or hay bales placed across a natural or constructed drainage way to prevent erosion in areas of concentrated flows.
2. Stone check dams shall not be utilized where the drainage area exceeds five acres. Hay bale check dams shall not be used where drainage areas exceed two (2) acres. Check dams shall not be installed in live streams.
3. Stone check dams shall be constructed of graded size two to ten (2 to 10) inch stone.

F. SEDIMENT BARRIER

1. STAKED HAYBALES - Sd1

Hay bale 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 thirty-six (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 twenty-five (25). Additionally, Type A fabric has a color mark.
- d. Type C silt fence is a woven thirty-six (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 seventy (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 riprap 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 shall be maintained throughout the duration of construction within the stream channel. The structures shall be designed by professionals familiar with storm water / drainage characteristics and applicable requirements to withstand flows from a two (2) year, twenty-four (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 shall 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" by Nilex, Inc., "Portadam" by Portadam Inc, interlocked sheet piling, riprap 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 one thousand (1,000) linear feet without stabilization. All other projects shall not exceed three hundred (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 six (6) months.
2. Mulch materials shall consist of dry straw or hay, wood chips, erosion control matting or netting, or polyethylene film. The mulch shall be uniform, spread over the designated area from two to four (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 fourteen (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 six (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

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 seventy (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 shall be undisturbed for more than (6) months.

E. DISTURBED AREA STABILIZATION (WITH SODDING) - Ds4

See Section 02485 – 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 twenty-four (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 shall be watered daily for the first five days after installation.
3. Sod shall be anchored on slopes steeper than three to one (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 two and one-half to one (2.5:1) and with a height of ten (10) 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 two (2) inches in diameter and three and one-half (3.5) feet in length. The cutting shall be freshly cut and alive. Two thirds (2/3) of 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** 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**.
- 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.

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 half the height of the device or when half 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 02125

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, 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 two (2) feet below the lowest point in the excavation.
- C. The **Contractor** shall use piezometric observation wells to monitor the groundwater level and 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.
- D. No separate payment shall 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 02324 – Trenching and Trench Backfilling
 - 2. Section 02521 – Concrete Sidewalks, Curbs and Gutters
 - 3. Section 02641 – Precast Concrete Manholes
 - 4. Section 02920 – Site Restoration

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 being taken against all hazards.
- C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the **Contractor** in good condition at all times 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 storm water 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. As a minimum at least one (1) density test shall be performed for every five thousand

(5,000) square feet of fill area and every two (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**, his agents or subcontractors, to conform to the requirements of these Contract Documents shall be paid by the **Contractor**. **Contractor** shall provide at least twenty-four (24) hours advance notice of earthwork operations to the Testing Laboratory. Testing 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 Environmental and Safety 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 - Submittals**. 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 two (2) weeks in advance of use and shall consist of one-half (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 ten (10) lb. (4.5-kg) Rammer and eighteen (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 three (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 (3) 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 ninety (90) pounds per cubic foot.
- c. All onsite fill material shall be soil exclusive of organic matter, frozen lumps, or other deleterious substances.
- d. It shall contain no rocks or earth clumps over three (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 02060 - Crushed Stone Aggregate 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 **County** 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 (3) 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. Procedure 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 one-half ($\frac{1}{2}$) width at a time, the slopes that are steeper than four to one (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. 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, which 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, which could in any way injure the work, adjacent property, or workmen.
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 three 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 shall remain the property of the **County** unless otherwise indicated by the **County**.

F. Extra Earth Excavation:

1. In case soft material, which, in the opinion of the **County** is not suitable, 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 pipelines 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 jackhammers or other suitable tools.
4. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jackhammers or other suitable tools.

5. Do not pull pavement with machines until completely broken and separated from pavement to remain.
6. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

NOTE: No additional payment shall be made for removing and replacing damaged adjacent pavement if negligence by the Contractor has occurred. This shall be the County's decision.

7. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
8. 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 ten (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 ground water level no higher than three (3) feet below the lowest point in the excavation.
5. Piezometric observation wells shall be required, to monitor the ground water 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. **Contractor** shall provide sufficient temporary pumping to ensure that surface and ground waters 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, 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 one (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 track hoe equal to a Caterpillar 225 rated with a three-fourths ($\frac{3}{4}$) cubic yard capacity

with a bucket curling pullout capacity of twenty-five thousand (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 two (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 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. All material in the opinion of the **County** that is unsuitable for foundation shall be removed and replaced with coarse aggregate or structural fill material as directed by the **County**.
- b. No determination of unsuitability shall 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 twelve (12) inches and bring the excavation to grade with compacted crushed stone.

C. Construction Observations:

1. All excavations may be examined by the **County** prior to reinforcing steel placement to verify that the design bearing pressure is available. All

excavations shall 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 three to four (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 six (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 eight inch (8) 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 six (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% 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 ninety-five (95) percent of the standard Proctor maximum dry density (ASTM D 698) of the fill soil.

2. The upper twelve-inches (12") of fill beneath the structures and pavement areas shall be compacted to ninety-eight (98) percent of the standard Proctor maximum dry density.
 3. Scarification and re-compaction 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 (1) row of knobs shall be two hundred fifty (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 ninety-five (95) percent 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 four (4) inch maximum loose thickness.
 6. If tests indicate that density of backfill fill is less than that specified, the area shall be either be recompactd 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 be used with the **County's** approval 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. Proof rolling:
1. All areas where pavement or structures are to be built on compacted fill and other areas where indicated on the Drawings, shall be proof rolled to detect soft spots prior to the placement of fill material or construction of foundations.

2. Proof rolling shall consist of the moving a twenty to thirty (20 to 30) ton loaded dump truck or pneumatic tire roller over the subgrade after the subgrade is shaped. Proof rolling shall be witnessed by the **County**.
 3. Pneumatic-tired rollers shall have not fewer than four pneumatic tired wheels which shall be of such size and ply that tire pressures can be maintained between eighty and one hundred (80 and 100) pounds per square inch for twenty-five thousand (25,000) pound wheel load during rolling operations. Unless otherwise required, rolling shall be done with tires inflated to ninety (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 shall 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 twenty-five thousand (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 twenty-five thousand (25,000) pound wheel load. The roller shall be operated not faster than five (5) feet/second.
 4. Subgrade shall be proof rolled with six (6) passes. Depressions that develop during the proof rolling operation shall be filled with suitable material and those filled areas shall be proof rolled with six (6) passes. If, after having been filled and proof rolled, the subgrade still contains depressions, the soil shall be undercut to the full depth of the soft material or five (5) feet, whichever is less, backfilled, and rolled to achieve a compacted subgrade.
 5. After the proof rolled 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 ten (10) tons. Finished surface of the subgrade shall be within a tolerance of four hundredths (0.04) of a foot at every point.
 6. Conduits, pipes, culverts, and underdrains shall be neither disturbed nor damaged by proof rolling operations. Rollers shall neither pass over, nor approach closer than five (5) feet to conduits, pipes, culverts and underdrains unless the tops of those facilities are deeper than three (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 (1) 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 attain the elevations indicated on the Drawings.
2. Perform rough grading to an accuracy of plus or minus one tenth (0.10) of a foot.

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, which shall ensure dry excavations, preserve final lines and grades, and do 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 one (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 thirty (30) days after receipt of written notice from the **County**.

3.10 CLEANING

- A. Upon completion of the work of this Section, remove all rubbish, trash, and debris resulting from construction operations in a lawful manner. Remove surplus equipment and tools. Leave the site in a neat and orderly condition acceptable to the **County**, and in conformance with the General Requirements 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 ASTM International (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 two (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. Tunneling Method:
 - a. 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 of the casing.
 - b. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing or tunnel.
 - c. Casing Design: Design of the bore pit and required bearing to resist jacking forces is 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**, with the approval of the **County**, at no additional cost. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal length may be

necessary.

2. 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 procedures, 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 shall be at no cost to the **County**.

3. Surface Settlement Monitoring Plan:

- a. The **Contractor** shall submit working drawings indicating the location, layout and detail of all surface settlement monitoring markers.
- b. Within forty-eight (48) hours of completion, the **Contractor** shall submit copies of installation notes and initial readings taken immediately after installation.
- c. Within twelve (12) hours after each reading **Contractor** shall submit a copy of the data sheet containing a cumulative history of all readings.

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:

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. The **Contractor** proposed to do the work shall have a minimum of five (5) continuous years of experience in steel casing and tunnel construction. Evidence of this experience shall be provided with the shop drawings for approval by the **County**.

1.03 STORAGE AND PROTECTION

All materials shall be stored and protected in accordance with the Manufacturer's recommendations and as approved by the **County**. Stockpiling of any materials on MARTA or CSX property shall **not** be permitted.

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 A36.
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 sixteen (16) mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of sixty-five (65) percent by volume and shall be air or airless spray applied, minimum drying time shall be seven (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 (4) flange-type or the two (2) flange lap-joint-type. Bolts and nuts used with the two- (2)-flange plates shall be a minimum of five-eighths (5/8) inch in diameter and shall conform to the latest revision of ASTM A307 for plate thickness less than 0.209 inch, and ASTM A449 for plate thickness equal to or greater than 0.209 inch. Bolts and nuts used with four (4) flange plates shall be not less than one-half (½) inch in diameter for plate thicknesses to and including 0.179 inch and not less than five-eighths (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 A307, Grade A. Each ring shall have two (2) inch- diameter half-couplings and plugs for grouting, located as shown on the Detail 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 eighty-five to ninety (85 - 90) durometer. Runners shall be attached to stainless steel risers that 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 fourteen (14) gauge band and ten (10) gauge risers, with two (2) inch wide fiberglass reinforced polyester insula duty PVC inner liner, minimum 0.09 inch thick, having a hardness of eighty-five to ninety (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, or Section 02665T - Transmission Water Mains. 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 submit alternate methods to the **County** for 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 sixty (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 nineteen (19) inches or greater designed for operation at thrusts of up to seventy (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 that 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 electricity, compressed air, diesel with approved scrubber, or other approved power. Electrical tools and equipment shall be grounded in accordance with the latest equipment 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 in 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. The **Contractor** shall examine the geotechnical report and borings and obtain all additional information as required to assure that the system provided shall be capable of operating successfully given groundwater conditions, soil type, rock profile, potential for obstructions and all geotechnical parameters pertinent to this type of microtunneling. 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 twenty-four (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 or railway 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 shall 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, OSHA, 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 twenty (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 ten and twenty-five (10 and 25) feet offset in each direction from the centerline of the casing. Tie settlement markers to benchmarks and indices sufficiently removed 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 one (1) inch, the **Contractor** shall immediately cease work and, using a method submitted to 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 the 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 fifty (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 one hundredth (0.01) of a 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 (1) end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the lower elevation 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 to maintain the integrity of the shaft and foundation.
 - 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. The **Contractor** shall submit calculations detailing the wall pressures exerted by the jacking operations for the full length of the jack distance.
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 wet boring.

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. Alignment and grade shall be monitored with a state-of-the-art laser system. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installation, the auger shall be removed and the alignment and grade checked at a minimum interval of sixty (60) feet.

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 for approval to the **County** a contingency plan that

shall 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 shall 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 02324 - Trenching and Trench Backfilling and Section 02200 - Earthwork, 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, the **Contractor** shall complete primary support to the excavated surfaces and keep all dewatering system(s) 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 new or existing structures, private or public properties and 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 be notified of the conditions requiring the supplemental actions. The **Contractor** shall take all necessary actions to mitigate the water flows, including, but not limited to, drilling 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, the **Contractor** shall complete installation of the primary support for that excavation cycle, and have qualified personnel periodically check conditions that might threaten tunnel stability.
4. Remove excavated rock from the excavation of the TBM erection as well as from 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 twenty-four (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 shall continue. Grout shall be placed under pressure in the annular void as the excavation proceeds. Grout shall 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

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 that, 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 shall 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 four (4) inch brick walls, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement.

3.09 SHEETING REMOVAL

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 to avoid cave-ins, subsidence, 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 - Earthwork
 - 2. Section 02324 - Trenching and Trench Backfilling
 - 3. 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 - Submittals**. 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: Concise Dictionary of Plants Cultivated in the U.S. and County, 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.

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 **Contractor** shall notify participants at least three (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 ninety (90) to one hundred (100) percent passing a two and one half (2½) inch sieve and not more than ten (10) percent passing a three quarter (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 one (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 four (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, forty-six (46) inches high supported by six (6) feet steel channel posts, five (5) feet on center. The **Contractor** shall set posts two (2) feet below grade.
- E. Chain Link Fence: Shall meet the requirements of the approved plans and submittals.

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 startup 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.

The **Contractor** shall install chain link fence according to the requirements of the approved plans and submittals.

- 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 three (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 **Contractor** 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 drip line of trees, the **Contractor** shall tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

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**.
- B. 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.
- C. Minor Fill: Where existing grade is six (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.
- D. Moderate Fill: Where existing grade is more than six (6) inches, but less than twelve (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 two (2) inches above elevation of finish grade and extend not less than eighteen (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 six (6) inches below elevation of grade.
 2. The **Contractor** shall place filter fabric with edges overlapping six (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 twenty-four (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 restoring to a normal growth pattern.
- C. The **Contractor** shall aerate surface soil compacted during construction ten (10) feet beyond drip line and no closer than thirty-six (36) inches to tree trunk. The **Contractor** shall drill two (2) inch diameter holes a minimum of twelve (12) inches deep at twenty four (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 them 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, windy weather (defined as when daily temperatures rise over eighty-five (85) degrees with no rain in the last 72 hours).

3.09 REPLACEMENT

- A. The **Contractor** shall be responsible for replacement of all 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

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 and the DeKalb County Department of Watershed Management Design Standards Manual.
- B. Excavation shall include the removal of all trees, stumps, brush, debris, or other obstacles that remain after the site preparation operations and 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 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. Haunch: 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 01210 - Measurement and Payment
2. Section 02200 - Earthwork
3. Section 02140 - Dewatering

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 **Contractor** shall submit a work plan for trenching and trench backfilling with complete written description that 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 a 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 (1) 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 of the strata 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/ft³ or 600 kN-m/m³)
 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/ft³ or 2,700 kN-m/m³)
 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 for 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

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 Work does not meet specified requirements, the **Contractor** shall remove Work, replace, and retest at no cost to the **County**.

1.06 JOB CONDITIONS

- A. All operations shall be performed by the **Contractor** in strict conformance with OSHA 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 **Contractor** 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. 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, 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 shall 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 shall be determined and approved by the **County**.
- E. 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.
- F. Utilities Notification Prior to Construction:
 - 1. Georgia law mandates that, before beginning all mechanical digging or excavation work, the **Contractor** shall contact Georgia 811 by using eRequest on www.Georgia811.com or by calling 811 or 1-800-282-7411.
 - 2. The **Contractor** may utilize EDEN (Excavation Digging Event Notification) web application that enables Members and Professional Excavators to create, manage, respond to, and edit Georgia 811 Locate Request Tickets.
 - 3. The **Contractor** shall retain all records of notification and responses during the course of the project until final Payment.
- G. 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 shall be responsible for all costs associated with the repair or replacement of the damaged utility facilities.
- H. 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.

- I. The **Contractor** shall provide a minimum of forty-eight (48) hour notice to the **County** and utility owner, and shall receive written notice to proceed before interrupting any utility.
- J. 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 shall be made by the **County**.
- K. 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. Augured piles shall be used instead of vibratory driven piles when near structures or existing sewers.
- L. The **Contractor** shall notify the **County** of unexpected subsurface conditions and discontinue work in affected area until the **Contractor** receives notification to resume work.
- M. The **Contractor** shall protect the bottom of the trench and soil adjacent to and beneath trench from frost.
- N. The **Contractor** shall prevent surface water run-off into a trench.

PART 2 - PRODUCTS

2.01 TRENCH FOUNDATION MATERIALS

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 Graded Aggregate Base (GAB) or Crusher Run.

2.02 BEDDING AND HAUNCHING MATERIALS

- A. Unless specified otherwise, bedding and haunching materials shall be GAB or crusher run 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).
- C. Filter Fabric - Non-Woven Type:

1. Filter fabric associated with bedding shall be a UV stabilized, spun-bonded, 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 shall be furnished for a minimum of 10 days during initial pipe installation.
4. Filter fabric shall be equal to TenCate Polyfelt TS 700, Trevira Fiber Company 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 two (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 sub-base elevation in paved areas.

2.05 SELECT BACKFILL

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

Concrete for bedding, haunching, initial backfill, or encasement shall have a compressive strength of not less than three thousand (3,000) psi, with not less than five and one-half (5½) bags of cement per cubic yard and a slump between three and five (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

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.

The **Contractor** shall receive direction from the **County** on which type of flowable fill shall be used on a case-by-case basis.

1. Flowable fill is a mixture of Portland cement, fly ash, fine aggregate, air entraining admixture, and water. Flowable fill contains low cementitious content for reduced strength development.
2. Ensure flowable fill is manufactured at plants that qualify at approved sources according to the Standard Operating Procedure for Quality Assurance for Ready-Mix Concrete Plants in Georgia.

2.08 GRANULAR MATERIAL

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

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 shall 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 - Earthwork. 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.

The **Contractor** shall not remove any trees without approval from the **County**.

- B. Trees and shrubs farther than ten (10) feet from pipe centerline shall not be removed unless designated for removal by the **County** and within the easement. The **Contractor** shall protect all other trees and shrubs.

3.02 DISPOSAL OF CLEARED MATERIAL

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

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 six (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 one (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 two (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, with the **County's** approval, 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 protect adjoining structures, roadways, pavement, utilities, trees, or private property, the **Contractor** shall provide sheeting and shoring. The **Contractor** shall 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 six (6) inch clearance between the rock and any part of the pipe or manhole. The maximum allowable width of rock excavation for payment shall be the outer diameter of the pipe bell to be installed plus twenty-four (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 shall provide clearance below the pipe barrel of eight (8) inches for pipe twenty-one (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 six (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 two (2) feet from the top edge of the open trench and may be used for backfilling as required. Topsoil 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 or useful as backfill shall be immediately disposed of away from the site of the Work in accordance with the requirements of Section 02200 - Earthwork.
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 Professional Engineer registered 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 shall 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 ten (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, free of large or loose knots, and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.
- E. Steel Sheet piling 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 shall 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 three (3) feet of an existing structure, utility, or pipeline. The **Contractor** shall cut off any sheeting left in place at least three (3) feet below the surface.
- H. Sheet piling within three (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 three (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 02200 – Earthwork and as directed by the **County**.
- B. Definition of Trench Rock: Any material that requires drilling and blasting, and occupies an original volume of at least one (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 $\frac{3}{4}$ -cubic-yard capacity with a bucket curling pullout capacity of 25,000 pounds.
- C. Blasting: The **Contractor** shall refer to Section 02020 – Use of Explosives
- D. Disposal of Rock: The **Contractor** shall dispose of rock, off site, that is surplus or not suitable for use as riprap 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 subcontractor, approved by the **County**, to: monitor the blasting by use of a seismograph; identify the areas where light charges shall 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 two (2) feet below the bottom of the trench.
- A. 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 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 two (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 two (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 six (6) to ten (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 shall be determined to be unsuitable and the **Contractor** shall then stabilize the trench by over-excavating the trench bottom and filling 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 a minimum ninety (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 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 twelve (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 ninety (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 twelve (12) inches above the pipe barrel. Layer depths shall be a maximum of six (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 ninety (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 twelve (12) inches 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 twelve (12) inches above the pipe barrel. The **Contractor** shall properly brace the pipeline in order to prevent floating of piping during concrete encasement

placement. The **Contractor** shall not backfill the trench for a period of at least twenty-four (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 six (6) inches shall be topsoil obtained as specified in this section.
- C. Excavated material that is unsuitable for backfilling shall be disposed of in accordance with the requirements of Section 02200 - Earthwork.
- 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 six (6) inch layers, if using light power tamping equipment, such as a "jumping jack"
 - 2. In twelve (12) inch layers, if using heavy tamping equipment, such as hammer with tamping feet
 - 3. In twenty-four (24) inch layers, if using a Hydraram HARDOX-400 compactor or equivalent.
- 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 ninety (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 ninety-five (95) percent of the maximum dry density.

3.15 BACKFILL WITHIN GEORGIA DOT RIGHTS-OF-WAY

Backfill within the GDOT rights-of-way shall meet the requirements stipulated in the "Utility Accommodation Policy and Standards," published by GDOT.

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 six (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 thirty-six (36) hours after placement. Minimum temperature of flowable fill at point of delivery shall be fifty (50) degrees F.
- C. The **Contractor** shall provide steel plates over flowable fill in road locations.

3.17 COMPACTED GRANULAR MATERIAL

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 ninety-five (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 two (2) feet of lift, with at least one test site 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 the **Contractor** shall perform density tests 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 **County** geotechnical personnel, 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

The **Contractor** shall dispose of excess excavated material, in accordance with the requirements of Section 02200 - Earthwork. The **Contractor** shall arrange for the disposal of excess materials, and shall bear all costs and expense of disposal.

+++ END OF SECTION 02324 +++

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 that are to remain as finish grade surfaces; and on all existing turf areas that 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 seven (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 02125 - Temporary and Permanent Erosion and Sediment Control
- B. Section 02486 - Sodding

1.03 QUALITY ASSURANCE

- A. Prior to seeding operations, the **Contractor** shall furnish to the **County** all 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 five and five tenths to seven (5.5 to 7.0). Topsoil shall contain not less than five (5) percent or more than twenty (20) percent, by weight, of organic matter as determined by loss on ignition of oven-dried samples to sixty-five (65°C0 degrees centigrade).

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 growers analysis testing to ninety eight (98) percent for purity and ninety (90) percent for germination. At the discretion of the **County**, 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 shall pass a No. 10 mesh screen and 50 percent shall 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 Weyerhaeuser 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 three to one (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, clear water 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, all topsoil surfaces shall be trimmed and worked to true line free from unsightly variation, bumps, ridges and depressions, and all detrimental material, and roots. All stones larger than two (2) inches in any dimension shall be removed from the soil. All non-residential and residential areas shall be hand raked to remove all detrimental material, roots, and stones
- B. No earlier than twenty-four (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 two (2) inches with a weighted disc, tiller, pulvimixer, or other equipment, until the surface is smooth.
- C. If the prepared surface becomes eroded because 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 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 thirty (30) minutes when a hydraulic seeder is used.
- D. Agricultural limestone shall be thoroughly mixed into the soil at a rate of one to two (1 to 2) tons per acre. The specified rate of application of limestone may be reduced by the **County** 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 **County** for adjustment in rates.
- E. It is the responsibility of the **Contractor** to 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 so that the seeding's are at the proper rate before seeding operations are started, and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.
- C. Immediately after sowing, the seeds shall be covered and compacted to a depth of one-eighth to three-eighths (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 the Table below, and shall be applied at the following rates shown:

Seeding Requirements		
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 two and one-half (2½) tons per acre or equivalent to two to four (2" to 4") inches thickness. The rate of application shall correspond to a depth of at least one inch and not more than one and one 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 three to one (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 five (5) gallons per one thousand (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. **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 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 grassing.
- 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 all 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 02125 - Temporary and Permanent Erosion and Sediment Control**; however, unstabilized areas of the construction corridor shall not exceed one thousand (1,000) linear feet on sanitary sewer sewers or water mains installed with easements and three hundred (300) linear feet for all other projects. Stabilization with permanent vegetation is preferred unless seasonal limitations exist.

END OF SECTION

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 02485 - Seeding
- D. 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 grass 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 two (2) inches or less than one (1) inch of soil.
- C. Sod strips shall have a consistent width of twelve or eighteen (12 or 18) inches.

2.02 FERTILIZER

- A. Fertilizer (10-10-10) used in connection with sodding, shall contain ten (10) percent nitrogen, ten (10) percent phosphoric acid and ten (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 thirty-three and one-half (33½) percent nitrogen.

2.03 LIME

- A. Agricultural limestone shall contain not less than eighty-five (85) percent of calcium carbonate and magnesium carbonate combined, and shall be crushed so that at least eighty-five (85) percent shall pass the No. 10 mesh sieve and fifty (50) percent shall 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 three (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 one (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 twenty-five (25) pounds of Grade 10-10-10, or equivalent, per one thousand (1,000) square feet. Agricultural limestone shall be applied at the rate of one hundred (100) pounds per one thousand (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 three to one (3 to 1) shall be held in place by wooden pins about one (1) inch square and six (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 two (2) weeks after which ammonium nitrate shall be applied at the rate of three (3) pounds per one thousand (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**

3.03 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 seven (7) days or less, temporary grassing, permanent grassing or permanent sodding shall be as specified in **Section 02125 - Temporary and Permanent Erosion and Sediment Control**; however, unstabilized areas of the construction corridor shall not exceed one thousand (1,000) linear feet on sanitary sewer sewers or water mains installed within easements and three hundred (300) linear feet for all other projects. The permanent vegetative stabilization method is preferred unless seasonal limitations exist.

END OF SECTION

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 which may be necessary to properly complete the Work as shown on the drawings and as specified herein.
- B. Related Work specified elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 02521 - Concrete sidewalks, curbs and gutters
 - 3. Section 02920 - Site Restoration
 - 4. Section 03200 – Concrete Reinforcement
 - 5. 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 Work in accordance with the requirements of the Georgia Department of Transportation (GDOT) 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 which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete and shall be a GDOT-approved facility.

1.04 PERFORMANCE REQUIREMENTS

- A. The **Contractor** shall comply with the performance standards and requirements established by GDOT.
- B. Paving: Pavement shall be designed for movement of trucks up to sixty-thousand (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 ninety-two (92) percent of theoretical density.
 - b. Asphaltic Concrete Hot Mix Binder Course: Not less than ninety (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 one-quarter ($\frac{1}{4}$) inch for base and intermediate courses, and not more than one-eighth ($\frac{1}{8}$) inch for surface courses. All testing shall 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 code 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 forty (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 thirty-five (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 thirty-five (35) degrees F and rising. The **Contractor** shall not place 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. Temporary cold or permanent hot asphalt patching will be required 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** shall adhere to the following chart with respect to minimum plate size and thickness.

Trench Width	Minimum Plate Thickness
10" (0.25 m)	1/2" (13 mm)
1'-11" (0.58 m)	3/4" (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 1/4" (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 twelve (12) inches beyond all edges of the trench.
3. For traffic speeds less than forty-five (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 forty-five (45) mph, approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (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 eight and one-half (8½) percent with a minimum twelve (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 either 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 fourteen (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 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 shall be performed in accordance with the requirements of the General Requirements.
- 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 seven (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 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.

2.03 SIDEWALKS

- A. Concrete for sidewalks shall be Class A conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

2.04 DRIVEWAYS

- A. Concrete for driveways shall be Class A conforming to the requirements of Section 03300 - Cast-In-Place Concrete and Section 03200 – Concrete Reinforcement

2.05 STANDARD GRANITE CURB, GRADE B

- B. Curbs shall be furnished in standard lengths of eight (8) feet in so far as possible employing shorter lengths where required such that the minimum length employed shall not be less than four (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 wheel chair 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.

2.06 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.

2.07 SPECIAL BRICK SIDEWALK REPLACEMENT

- A. All brick shall be solid pavers conforming to the requirements of the GDOT Standard Specifications Construction of Transportation Systems, Latest Edition. The **Contractor** shall submit to the **County** for review on 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.

2.08 STAMPED HEXAGONAL CONCRETE PAVERS

- A. Where existing, hexagonal concrete pavers shall 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.

2.09 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 GDOT 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 six (6) inches wide on GDOT streets and **County** streets designated as arterial. Traffic stripe shall be four (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 therefore 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, eight (8) inches in diameter or less located across paved surfaces shall be installed by boring or other approved methods that shall not require cutting or removing the pavement where feasible. This is to be approved by the **County**.
- G. All concrete pavement replaced shall not be less than four (4) inches thick or equal to the original if greater than four (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 three (3) inches thick consisting of a binder and seal coat. Wearing surfaces shall be slag sealed in accordance with the requirements established by GDOT.

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 six (6) inches thick, unless continuing tests indicate that the required results are being obtained with thicker layers.
 - 3. In no case shall more than eight (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 recompact 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 twenty-four (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 two-hundred and twenty-five (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 shall 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 the **County**.

2. The **Contractor** shall place the asphaltic concrete mixture at a rate that shall 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 twenty-four (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 six (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 shall bear weight of roller without excessive displacement.
- C. The **Contractor** shall not permit heavy equipment, including rollers to stand on 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 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 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" 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 six (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 required to be installed 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 one (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 existing pavement section including 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 four (4) inch thick concrete base slab and meet the same requirements as Standard Concrete Sidewalk four (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 four (4) foot by a four (4) foot test panel for approval by the **County**. A standard concrete sidewalk four (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 GDOT 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 02200 - Earthwork
 - 2. Section 02510 - Pavement Repair
 - 3. Section 03200 - Concrete Reinforcement
 - 4. 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

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 three thousand (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 three to six (3 to 6) percent air shall be used. Air entraining admixtures that 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 three (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 three (3) inches or more of sub-base material. Sprinkle with water and compact by rolling or other approved method. 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 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 ninety-eight (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 one-eighth (1/8) inch in ten (10) feet, and shall show no lateral variation greater than one-quarter (1/4) inch in ten (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 so constructed 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 twelve (12) hours after the concrete has been placed.
- C. Joints:
1. Joints shall be constructed 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 one-quarter (1/4) 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 ten (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 one and one half (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 one quarter (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 one-eighth (1/8) inch in ten (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 (2) increments, the second application shall follow the first application within thirty (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 one (1) gallon per two hundred (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 four (4) inches thick, minimum.
- B. At locations where the new sidewalk is to abut existing concrete, saw cut concrete for a depth of two (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 (2) increments, the second application shall follow the first application within thirty (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 one (1) gallon per two hundred (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 seven days.
 - 2. All damage caused by people, vehicles, rain, animals, and 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 four (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 02485 - Seeding.

+++ END OF SECTION 02521 +++

SECTION 02537 DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE

- A. Provide all labor, materials, equipment and incidentals necessary to construct all ductile iron pipe and appurtenances as shown on the Drawings and as specified herein and the DeKalb County Department of Watershed Management Design Standards Manual.
- B. Ductile iron pipe and appurtenances covered under this Section shall include all interior pipe and accessories to the outside face of structures and buildings, except where there is no joint at the outside face. Where there is no joint at the exterior face, this Section shall include all ductile iron pipe and accessories within two feet of the exterior face of the structure or building.
- C. This Section includes piping and fittings in utility vaults and manholes.

1.02 SUBMITTALS

- A. Complete shop drawings and product data on all piping and fittings shall be submitted to the Engineer in accordance with the requirements of Section 01300 of these Specifications.
- B. Shop drawings shall indicate piping layout in plan and/or elevations and shall include a complete schedule of all pipe, fittings, specials, hangers and supports. Special castings shall be detailed showing all pertinent dimensions. Special coatings shall be clearly identified.
- C. The **Contractor** shall furnish the Inspector with lists of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size and description of each item received.
- D. The **Contractor** shall submit written evidence to the Engineer that the products furnished under this Section will conform with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the **Contractor** furnish test reports from an independent testing laboratory on samples of pipe materials.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE (DIP)

- A. Ductile iron pipe shall be utilized for all piping where shown on the Drawings.
- B. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
8	350
14 - 18	350
20	300
24	250
30 - 54	200

- C. Flanged pipe minimum wall thickness shall be equal to Special Thickness Class 53. Flanges shall be furnished and assembled onto the pipe by the manufacturer, not a pipe fabricator.
- D. For restraint joint pipe, the manufacturer should determine the maximum required pipe length to provide horizontal and vertical deflection shown on the Drawings based on the type of restraint joint used.

2.02 FITTINGS AND ACCESSORIES

- A. Fittings shall be ductile iron and shall conform to AWWA C110/ANSI A21.10 or AWWA C153/ANSIA21.53 with a minimum rated working pressure of 250 psi.
- B. Flanged elbow fittings shall be ANSI pattern using short radius elbows except where noted differently on the Drawings. Special fittings, ductile iron wall pipes and sleeves shall conform to the dimensions and details as shown on the Drawings.
- C. Thrust Collars: Thrust collars shall be welded-on ductile iron body type capable of withstanding a thrust due to 250 psi internal pressure on a dead end from either direction on that pipe size. The welded-on collars shall be continuously welded to the pipe by the pipe manufacturer.
- D. Solid sleeves shall permit the connection of plain end ductile iron pipe. Solid sleeves shall meet the requirements of ANSI/AWWA C110 for long pattern and have a minimum pressure rating of 250 psi. Solid sleeves shall have mechanical or restrained joints as specified in this Section and as shown on the Drawings.

Solid sleeves shall be used only in locations shown on the Drawings or at the direction of the Engineer.

- E. Restrained Flange Adapter (RFA): The RFA shall permit the connection of unthreaded, ungrooved, open-ended ductile iron pipe to ANSI/ASME B16.1, Class 125 flanges. The RFA shall meet the test requirements of ANSI/ASME B16.1 for Class 125 flanges. The RFA shall be a ductile iron casting incorporating gripping wedges and gasket. The gasket shall provide a compression seal between the RFA, the pipe and the adjacent flange. RFAs are to be used only in locations specifically shown on the Drawings and shall be installed in accordance with the manufacturer's recommendations. The RFA shall be EBAA Iron Megaflange-Flange Adapter Series 2100 or Star Pipe Products StarFlange Series 3200.
- F. Service Clamps: Service clamps shall be ductile iron, double strap clamps equal to Mueller.

2.03 Joints

A. General

- 1. Unless shown or specified otherwise, joints for buried service shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Joints for exposed service shall be flanged for pipe and fittings, unless shown otherwise.
- 2. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with 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.
- 3. In all cases, gaskets shall be made of material that will not be damaged by the fluid being transported nor by the environment in which the pipe is installed.

B. Push-On and Mechanical Joints

- 1. Joints shall conform to AWWA C111/ANSI A21.11. Bells shall be integrally cast with the pipe.
- 2. Bolts and nuts shall be Tee Head bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimension shown in AWWA C111/ANSI A21.11.
- 3. Gaskets shall be in accordance with AWWA C111/ANSI A21.11 and shall be constructed of Neoprene unless otherwise shown on the Drawings.
- 4. Mechanical joint glands shall be ductile iron.

C. Flanged Joints

1. Flanged joints shall conform to AWWA C115/ANSI A21.15. Flanges shall be ductile iron and shall be furnished by the pipe manufacturer.
2. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
 - a. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.
 - b. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.
3. Gaskets shall be made of 1/8-inch thick, Neoprene. Gaskets may be ring type or full face type.
4. For 16-inch and larger flanged joints use gaskets equal to American Toruseal" or US Pipe "Flange Tyte".
5. Flanged ductile iron pipe shall have flanges cast solidly or threaded to the pipe barrel. Pipe threads shall be of such length that with flanges screwed home, the end of the pipe shall project beyond the face line of the flange. Flange and pipe shall then be machined to give a flush finish to the pipe and the flange and surface shall be normal to the axis of the pipe. Ductile iron flanges shall be of such design that the flange neck completely covers the threaded portion of the pipe to protect same against corrosion. All pipe with threaded type flanges shall be assembled, faced, and drilled at the point of manufacture, unless otherwise approved by the Engineer.
6. Flange filler shall conform to AWWA C110/ANSI A21.10. Joint bolt length shall be increased by the thickness of the flange filler.
7. Where tap or stud bolts are required, flanges shall be drilled and tapped accordingly.

D. Restrained Joints

1. Manufactured restrained joints shall be American, FLEX-RING or LOK-RING, U.S. Pipe TR FLEX.
2. Restraining gasket joints shall be assembled with ACIPCO American Fast-Grip gaskets or US Pipe FIELD LOK gasket.
3. No field welding of restraint pipe will be permitted.

4. Bolts, nuts and joint accessories shall be in accordance with manufacturer's recommendations.
5. Gaskets shall be in accordance with manufacturer's recommendation.

2.04 WALL SLEEVES AND WALL PIPES

- A. Where piping passes through concrete structures, furnish and install wall sleeves unless wall pipes or other provisions are specifically shown on the Drawings.
- B. Wall Sleeves
 1. For pipe sizes smaller than 3-inches, wall sleeves shall be steel oversize sleeves furnished with a full circle, integral or continuously welded waterstop collar. The sleeve seal shall be the mechanically expanded, synthetic rubber type. Provide all associated bolts, seals and seal fittings, pressure clamps or plates necessary to achieve a watertight installation. Sleeves shall extend the full thickness of the concrete. Sleeves and seal shall be Link Seal.
 2. For larger pipe sizes, wall sleeves shall be statically cast ductile iron mechanical joint wall sleeves. Unless specified or shown otherwise for a specific situation, wall sleeves shall be mechanical joint bell-plain end type with waterstop/thrust collar. Sleeves shall be constructed with studs and mechanical joint [retainer] gland on the air side of the concrete structure. Provide retainer gland where shown on the Drawings. Where the concrete structure is exposed to dirt on one side and is wet on the other side, construct with studs and glands on the dirt side.
- C. Wall Pipes: Wall pipes shall be cast and/or fabricated and lined in one manufacturer's facility and delivered to the job site ready for use.

2.05 COATINGS

The exterior of pipe and fittings for buried service shall be factory zinc coated with an asphaltic coating conforming to AWWA C151/ANSI 21.51 for ductile iron pipe, AWWA C115/ANSI 21.15 for flanged pipe and AWWA C110/ANSI 21.10 for fittings.

2.06 LININGS

- A. Pipe and fittings shall be cement lined in accordance with AWWA C104/ ANSI A21.4, standard thickness, unless specified or shown otherwise.

2.07 RETAINER GLANDS

Retainer glands for ductile iron pipe shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, or Star Pipe Products StarGrip Series 3000.

2.08 POLYETHYLENE ENCASEMENT

Ductile iron pipe shall be encased with polyethylene film where shown on the Drawings. Polyethylene film shall have a minimum thickness of 8 mils.

PART 3 EXECUTION

3.01 CUTTING

- A. When new or existing pipe is required to be cut, the pipe shall be cut in such a manner as to leave a smooth end normal to the axis of the pipe.
- B. All cutting of ductile iron pipe shall be performed with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe. All damaged linings and coatings shall be repaired.
- C. Lining Repair: Repair epoxy linings and recoat spigot ends of cut pipe with Protecto 101 or Madewell 1104 coal tar epoxy in accordance with the manufacturer's recommendations and as specified below:
 - 1. Remove all burrs and areas of loose lining materials by sanding or scraping to bare metal.
 - 2. Remove oil and lubricants used during field cutting.
 - 3. Lining shall be stripped back a minimum of 1-inch from the spigot end into well adhered lined areas.
 - 4. Roughen 1 to 2-inches of good lining with a rough grade (40 grit) emery paper, rasp or small chisel, to allow an overlap between new and existing lining.
 - 5. Apply lining repair material in the number of coats required to match the thickness requirements as specified in Part 2 of this Section and in accordance with the manufacturer's recommendations.

3.02 JOINT ASSEMBLY

- A. General: Ductile iron pipe shall be assembled in accordance with ANSI/AWWA C600.
- B. Push-On Joints: The inside of the bell and the outside of the pipe from the plain

end to the guide stripe shall be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe. The plain end shall be centered in the bell and the spigot pushed home.

C. Mechanical Joints

1. The surfaces with which the rubber gasket comes in contact shall be brushed thoroughly with a wire brush just prior to assembly to remove all loose rust or foreign material which may be present and to provide clean surfaces which shall be brushed with a liberal amount of soapy water or other approved lubricant just prior to slipping the gasket over the spigot end and into the bell. Lubricant shall be brushed over the gasket prior to installation to remove loose dirt and lubricate the gasket as it is forced into its retaining space.
2. Joint bolts shall be tightened by the use of wrenches and to a tension recommended by the pipe manufacturer. When tightening bolts, the gland shall be brought up toward the pipe bell. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation shall not be permitted.
3. After installation, bolts and nuts in buried piping shall be given two heavy coats of a bituminous paint.

D. Flanged Joints

1. All flanges shall be true and perpendicular to the axis of the pipe. Flanges shall be cleaned of all burrs, deformations, or other imperfections before joining. Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. Where screwed flanges are used, the finished pipe edge shall not extend beyond the face of the flange, and the flange neck shall completely cover the threaded portion of the pipe.
2. Connections to equipment shall be made in such a way that no torque is placed on the equipment flanges. Connecting flanges must be in proper position and alignment and no external force may be used to bring them together properly.
3. Flanged filler shall be used only where shown on the Drawings or approved by the Engineer to make up minor differences in pipe length, less than 3-inches. Joint bolts shall be increased in length by the thickness of the flange filler.

3.03 DRILLING AND TAPPING

- A. Wherever required ductile iron pipe and fittings shall be drilled and tapped to receive any other piping. All holes shall be drilled accurately at right angles to the axis of any pipe or fitting. Where plugs are drilled, holes shall be at right angles to the face of the plug.
- B. Unless shown otherwise, small diameter pipes, less than 2-inches, shall be connected to ductile iron pipe using one of the following methods:
 - 1. Direct tap.
 - 2. Direct tap with service clamp.
 - 3. Direct tap boss.
 - 4. Tapped plug or flange on tapping saddle.
- C. In no case shall the effective number of threads be less than 4.

3.04 CONSTRUCTING BENEATH AND BEYOND STRUCTURES

- A. All ductile iron pipes entering buildings or basins shall be adequately supported between the structure and undisturbed earth to prevent damage resulting from settlement of backfill around the structure.

3.05 CONSTRUCTING WITHIN STRUCTURES

- A. Proper and suitable tools and appliances for safe and convenient handling and laying of pipe and fittings shall be used. Care shall be taken to prevent the pipe coating from being damaged, particularly cement linings on the inside of the pipes and fittings. Any damage shall be remedied as directed by the Engineer.
- B. All pipe and fittings shall be carefully examined by the **Contractor** for defects just before installing and no pipe or fitting shall be installed if it is defective. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the **Contractor** at **Contractor's** own expense.
- C. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.
- D. All elbows, tees, brackets, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust.
- E. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be

installed. Pipe passing through the sleeve shall extend no more than three feet beyond the structure without a piping joint.

- F. Wall pipe and wall sleeves shall be constructed when the wall or slab is constructed. Blocking out or breaking of the wall for later installation shall not be permitted.
- G. Cutting or weakening of structural members to facilitate pipe installation shall not be permitted. All piping shall be installed in place without springing or forcing.

3.06 INSPECTION AND TESTING

All testing shall be in accordance with the requirements of Section 02665 and Section 02665T of these Specifications.

END OF SECTION

SECTION 02607

MANHOLES, JUNCTION BOXES, CATCH BASINS AND INLETS

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals required to install cast-in-place and precast concrete manholes, junction boxes, catch basins, and inlets. The term manholes, as used herein and shown on the Drawings, includes manholes, junction boxes, catch basins, and inlets. All Work shall be installed, adjusted, tested, and placed in operation in accordance with these Specifications, the manufacturer's recommendations, and as shown on the Drawings.
- B. Related Work Specified Elsewhere:
 - 1. 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 - Submittals**. In addition, the following specific information shall be provided:
 - 1. Complete shop drawings and engineering data on frames, covers, steps, and precast manhole sections and flotation calculations shall be submitted to the **County** in accordance with the requirements of the General Requirements of the Contract Documents.

1.03 QUALITY ASSURANCE

- A. Prior to delivery, all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the **County**, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials that fail to conform to these Specifications shall be rejected.
- B. After delivery to the site, any materials that have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the site.

1.04 QUALITY STANDARDS

- A. Manufacturers offering products that comply with these specifications include:
 - 1. Standard manhole frame and cover
 - a. Vulcan Foundry, VM-26
 - b. Neenah Foundry, Series R-1700
 - c. Or approved equal
 - 2. Manhole adjusting rings
 - a. Neenah Foundry, R1979-H
 - b. Higgins Foundry
 - c. Or approved equal

1.05 WARRANTY

- A. Provide a manufacturer's 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. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Drawings or as otherwise directed by the **County**. The height or depth of the manhole will vary with the location, but unless shown otherwise on the Drawings, shall be such that the top of the manhole frame will be at the finished grade of the pavement or ground surface and the invert shall be at the designated elevations.

2.02 MATERIALS AND CONSTRUCTION

- A. Concrete and Reinforcement:
 - 1. Concrete used in manhole and junction chamber construction shall be Class "A" concrete conforming to the requirements of **Section 03300 - Cast-In-Place Concrete**.
 - 2. Brick: The brick shall conform to the requirements of AASHTO M 91.
 - 3. Mortar: The mortar for brick masonry and similar Work shall be composed of one (1) part of Portland cement and two (2) parts of mortar sand, by volume. The Portland cement shall conform to the requirements of AASHTO M 45. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed fifteen (15) percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6. The water shall be clean and free of deleterious amounts of acids, alkalis, or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T 26.

B. Precast Concrete Manholes:

1. Precast concrete manholes shall consist of precast reinforced concrete sections, a concentric cone or flat slab top section, and a base section conforming to the typical manhole details as shown on the Drawings.
2. Precast manhole section shall be manufactured, tested, and marked in accordance with the latest provisions of ASTM C 478.
3. The minimum compressive strength of the concrete for all sections shall be four thousand (4,000) psi.
4. The maximum allowable absorption of the concrete shall not exceed eight (8) percent of the dry weight.
5. The circumferential reinforcement in the riser sections, conical top sections and base wall sections shall consist of one (1) line of steel and shall be not less than seventeen hundredths (0.17) square inches per lineal foot.
6. The ends of each reinforced concrete manhole riser section and the bottom of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous and uniform manhole.
7. Joints of the manhole sections shall be of the tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to the applicable provisions of ASTM C443, latest revision, or filled with an approved preformed plastic gasket meeting the requirements of Federal Specifications 55-5-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form.
8. Each section of the precast manhole shall have not more than two (2) holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.
9. Manhole steps shall not be installed in manholes.

C. Brick Structures:

1. Foundations: A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of **Section 03300 - Cast-In-Place Concrete**. The foundation shall be built to the correct elevation and shall be finished to cause the least possible resistance to flowing water.
2. Laying Brick: All brick shall be clean and thoroughly wet before laying so that they shall not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within forty-five (45) minutes after water has been added shall be discarded. Re-tempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it, which can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where

- possible and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.
3. Joints: All joints shall be slushed with mortar at every course but slushing alone shall not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or pargeted with a coat of mortar not less than one-half (1/2) inch thick before the backing is laid up. Prior to pargeting, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than one-quarter (1/4) inch or more than one-half (1/2) inch wide and whatever width is adopted shall be maintained uniform throughout the work.
 4. Pointing: Face joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.
 5. Cleaning: Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing down with water and, if necessary to produce satisfactory results, cleaning shall be done with a five (5) percent solution of muriatic acid that shall then be rinsed off with liberal quantities of clean, fresh water.
 6. Curing and cold weather protection: In hot or dry weather, the brick masonry shall be protected and kept moist for at least forty-eight (48) hours after laying the brick. Brick masonry Work or pointing shall not be done when there is frost in the brick or when the air temperature is below fifty (50) degrees F unless the **Contractor** has on the project, ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than sixty (60) degrees F for the duration of the curing period.

D. Frames and Covers:

1. Frames and Covers shall conform to the DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version.
2. An adjusting ring shall be provided for each manhole in a street.
3. Provide solid manhole and handhole covers and frames for electrical underground systems. Covers shall have letters "HIGH VOLTAGE," "LOW VOLTAGE," "SIGNAL," as applicable, embossed on top.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF CAST-IN-PLACE CONCRETE MANHOLES

- A. Cast-in-place manholes, excluding curved manhole bases, shall be constructed in place with the base, barrel, and conical section all monolithically cast using removable forms of material and design approved by the **County**.
- B. The vertical forms, vertical and horizontal wall spacers, steps, and placing cone shall be carefully positioned and firmly clamped in place before any placement is made. The wall spacers shall be located ninety (90) degrees from each other. The forms shall be firmly supported with bottom of forms at the proper elevation to

permit the base to be deposited through the vertical forms.

- C. No pipe penetration shall be formed within twelve (12) inches of a corner, on square bases, or within twelve (12) inches of another penetration, in any direction, for circular bases.
- D. The manhole base shall be deposited down through the wall forms onto undisturbed earth or shall be rock bearing. It shall be evenly distributed around the walls and vibrated both inside and outside the forms until there is a minimum slope of sixty (60) degrees from the bottom of the forms to the bearing surface both inside and outside of the manhole. When this is complete and before additional concrete is added, the concrete shall be carefully vibrated on each side of each sewer pipe.
- E. The base shall be concentric with the manhole, except where eccentric alignment with ladder is required, and have a minimum diameter of four (4) feet or sixteen (16) inches greater than the outside diameter of the manhole whichever is greater, and ten (10) inch minimum thickness under the lowest pipe. Minimum wall thickness shall be six (6) inches.
- F. Additional concrete shall be deposited in evenly distributed layers of approximately eighteen (18) inches with each layer vibrated to bond it to the preceding layer. The wall spacers shall be raised as the placements are made. The concrete in the area from which the spacer is withdrawn shall be carefully vibrated. Excessive vibration shall be avoided.
- G. Adjustment rings shall be provided between the conical section and the manhole frame. The rings shall be cast-in-place using building felt between pours to create a weakened joint or as directed by the **County**. If adjustment of the lid elevation is called for, concrete adjusting rings shall be used.
- H. All manhole bases, including curved manhole bases and inverts shall be constructed of Class "A" concrete in accordance with details on the Drawings. Inverts shall be smooth and accurately shaped and have the same cross section as the invert of the sewers that they connect. The manhole base and invert shall be carefully formed to the required size and grade by gradual and even changes in sections, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations. Changing directions of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. The invert and flow channel shall be formed during or immediately after the placing of the concrete and brush-finished as soon as the concrete has sufficiently set.
- I. Form marks and offsets shall not exceed one (1) inch on the outside surface of the manhole. Form marks and offsets shall not exceed one-half (1/2) inch inside of the manhole. All offsets on the inside surface of the manhole shall be smoothed and rubbed so there is no projection or irregularity capable of scratching a worker or catching and holding water or other materials. Honeycombed areas shall be completely removed immediately upon removal of the forms and replaced with a Class "A" concrete as directed by the **County**, or patched with epoxy grout.
- J. Should circumstances make a joint necessary, a formed groove or reinforcing

dowels shall be required in the top of the first placement for shear protection. Immediately before the second placement is made, the surface of the cold joint shall be thoroughly cleaned and wetted with a layer of mortar being deposited on the surface.

- K. Concrete setting time and backfilling shall be in accordance with the applicable requirements of **Section 03300 - Cast-In-Place Concrete** shall be allowed to set for a period of not less than twenty-four (24) hours. Outside forms, if any, then shall be removed and the manhole backfilled and compacted. All loose or waste material shall be removed from the interior of the manhole. The manhole cover then shall be placed and the surface in the vicinity of the Work cleaned off and left in a neat and orderly condition.

3.02 CONSTRUCTION OF PRECAST CONCRETE MANHOLES

- A. After placing a manhole base, inverts shall be constructed using Class "A" concrete and three to five (3 to 5) inches slump range in accordance with details on the Drawings and inverts shall have the same cross section as the invert of the sewers that they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- B. After the base section has been set, and inverts formed, the precast manhole sections shall be placed thereon, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations.
- C. The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the riser section. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown, and grade of the existing adjacent pavement.
- D. After backfilling has been completed, the excavated area, if located in a street, alley, or sidewalk, shall be provided with a temporary surface.

3.03 MANHOLES OVER EXISTING SEWERS

- A. Construct manholes over existing operating sewer lines at locations shown. Perform necessary excavation as specified hereinbefore, support precast concrete MH base over existing pipe on brick or solid concrete block then pour concrete slab base, break into existing line, construct riser sections, and complete Manhole construction.
- B. Maintain flow through existing sewer lines at all times and protect new concrete and mortar Work for a period of seven (7) days after concrete has been placed. Advise **County** of plans for diverting sewage flow and obtain **County's** approval before starting. **County's** approval shall not relieve **Contractor** of responsibility for maintaining adequate capacity for flow at all times and adequately protecting new and existing work.
- C. Construct the new base under the existing sewer and the precast sections as

specified herein.

- D. Break out the existing pipe within the new manhole, cover the edges with mortar, and trowel smooth. Gain approval from the **County** prior to breaking out the existing pipe.

3.04 INSPECTION AND TESTING

- A. After completion, all manholes shall be inspected. The **Contractor** shall make, at **Contractor's** expense, all necessary changes, modifications, and/or adjustments required to assure satisfactory operation.

END OF SECTION

SECTION 02641 PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes precast concrete manholes installation; frames and covers; pipe connections at manholes; manhole testing; backfill; cleanup; 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 precast concrete manholes 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 Sections Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 02140 - Dewatering
 - 3. Section 02200 - Earthwork
 - 4. Section 02324 - Trenching and Trench Backfilling
 - 5. Section 02510 - Pavement Repairs
 - 6. Section 02920 - Site Restoration
 - 7. Section 03200 - Concrete Reinforcement
 - 8. 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. In addition, the following specific information shall be provided.
 - 1. The **Contractor** shall submit manufacturer's data and details of the following items for approval:
 - a. Shop drawings of manhole sections and base units and construction details, including: reinforcement, jointing methods, and materials
 - b. Summary of criteria used in the manhole design including, as a minimum: material properties, loadings, load combinations, and dimensions assumed
 - c. Materials to be used in fabricating drop connections
 - d. Materials to be used for pipe connections at manhole walls
 - e. Materials to be used for stubs and stub plugs, if required
 - f. Materials and procedures for corrosion resistant liner and coatings, if required
 - g. Plugs to be used for vacuum testing

- h. Manufacturer's data for pre-mix (bag) concrete, if used for channel inverts and benches
- i. Description of the proposed method of concrete curing

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 C270 - Standard Specification for Mortar for Unit Masonry
 - 2. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gaskets
 - 3. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
 - 4. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
 - 5. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink)
- B. Prior to delivery, all basic materials specified in this section shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the **County**, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials that fail to conform to these Specifications shall be rejected.
- C. After delivery to the site of the Work, any materials that have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the site of the Work.
- D. Precast concrete producer shall demonstrate adherence to the standards set forth in the National Precast Concrete Association Quality Control Manual. Precast concrete producer shall meet requirements written below.
 - 1. Qualifications, Testing and Inspection
 - a. The Precast concrete producer shall have been in the business of producing precast concrete products similar to those specified for a minimum of five (5) years. The precast concrete producer shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the precast concrete producer to produce quality products consistent with industry standards.
 - b. The Precast concrete producer shall show that the following tests are performed in accordance with the ASTM standards indicated. Tests shall be performed for each one hundred fifty (150) cu. yd. of concrete placed, but not less frequently than once per week.
 - (1.) Slump: C143
 - (2.) Compressive Strength: C31, C192, and C39

- (3.) Air Content (when air-entrained concrete is being used)
C231 or C173
- (4.) Unit Weight: C138
- c. The Precast concrete producer shall provide documentation demonstrating compliance with this subparagraph.
- d. The plant shall notify the **County** when the pre-cast products are being produced for the project. The **County** may place an inspector in the plant when the products covered by this specification are being manufactured.

1.04 DESIGN CRITERIA

- A. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Plans or as otherwise directed by the **County**. The height or depth of the manhole will vary with the locations, but unless shown otherwise on the Plans shall be such that the top of the manhole frame will be at the finished grade of the pavement or higher than the ground surface as shown on the Plans and the invert shall be at the designed elevations.

PART 2 – PRODUCTS

2.01 PRECAST CONCRETE MANHOLES

- A. Unless specified otherwise in the Plans or in the Special Conditions, all manholes shall be precast concrete manholes as specified in this section.
- B. The precast reinforced concrete manholes shall be constructed in accordance with the requirements of ASTM C478. Reinforced concrete manholes shall consist of manhole base sections, riser sections, transition sections, and conical sections as described in this section. The manhole components shall be configured to minimize the number of joints required per manhole (see Detail Drawings). The **County** may require any manhole that is not composed of the minimum number of sections to be replaced.
- C. Portland cement concrete used in the precast reinforced concrete manholes shall have a minimum compressive strength of four thousand (4,000) psi at twenty-eight (28) days.
 - 1. The concrete shall contain type II Portland cement with a C3A content of five and one-half (5½) percent or less and meet the requirements of ASTM C478.
 - 2. Aggregate for concrete, except for maximum size and gradation, shall be as specified in applicable sections of these Specifications.
 - 3. To aid in achieving the specified concrete compressive strength, newly cast manholes shall be cured in accordance with the requirements of ASTM C478. The method of curing proposed shall be submitted to the **County** prior to manufacture. Manholes shall be cured for a minimum of

seven (7) days prior to shipment to the site unless otherwise instructed by the **County**.

4. The manhole manufacturer shall test the compressive strength of a minimum of two (2) concrete cylinders per calendar week. Reports verifying the results of the compression tests shall be maintained at the manufacturer's facility. Reports shall be made available for inspection and review by the **County's** representatives. The manhole manufacturer shall permit the **County's** representatives to make unannounced reviews of compression test records and inspection of manufacturing facilities at any time during normal business hours.
5. The manhole manufacturer shall notify the **County** of all manholes delivered for use in the **County's** sanitary sewer system that were manufactured during a week for which a concrete compressive strength test yielded a result of less than four thousand (4,000) psi.
 - a. Notification shall include (at a minimum) the project name, **Contractor** name, date of manhole component manufacture, and description of manhole component(s) affected.
 - b. The **County** may require additional testing, repairs, or removal and replacement, at no additional cost to the **County**, of any or all manhole components provided for use in the **County's** sanitary sewer system that were manufactured during a calendar week for which a concrete compressive strength test yields a result of less than four thousand (4,000) psi.
- D. Reinforcing steel shall be bars of intermediate grade, open hearth, billet steel, conforming to the requirements of ASTM A615, or Cold-Drawn Steel Wire for Concrete Reinforcement conforming to the requirements of ASTM A82; or of wire fabric conforming to the requirements of ASTM A185. The circumferential reinforcement in the riser and conical top sections shall have an area of not less than twelve-hundredths (0.12) square inches per linear foot.
- E. The interior and exterior surfaces of the manhole shall have a smooth hard finish, and shall be free from cracks, chips, and spalls.
- F. The maximum allowable absorption of the concrete used for manhole construction shall not exceed eight (8) percent of the dry weight.
- G. Manhole base sections shall be circular, wet cast, and may be supplied in forty-eight (48) inches, sixty (60) inches, seventy-two (72) inches, eighty-four (84) inches, and ninety six (96) inches diameters. Heights shall range from forty-eight (48) inches to ninety six (96) inches depending on availability with diameter and as specified or approved by the **County**. All base sections shall be supplied with Manhole Lift System inserts as manufactured by Press-Seal Gasket Corporation. Lifting eye bolts, also manufactured by Press-Seal Gasket Corporation, shall be supplied to the **Contractor** upon request. Manhole bases manufactured with pipe openings eighteen (18) inches or less shall be furnished with Kor-N-Seal flexible pipe-to-manhole connectors. Pipes with diameters greater than eighteen (18)

inches shall be secured with a concrete cradle installed to the springline of the pipe utilizing Class "B" concrete conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

- H. Riser sections shall be circular, wet, or dry cast, and may be supplied in the following sizes: forty-eight (48) inches, sixty (60) inches, seventy-two (72) inches, eighty-four (84) inches, and ninety-six (96) inches in diameter. Heights shall range from sixteen (16) inches to forty-eight (48) inches in sixteen (16) inch multiples depending on availability with diameter and as specified or approved by the **County**. All riser sections shall be supplied with Manhole Lift System inserts as manufactured by Press-Seal Gasket Corporation. Lifting eye bolts, also manufacture by Press-Seal Gasket Corporation, shall be supplied to the **Contractor** upon request.
- I. Transition sections shall be wet or dry cast. Conical transition sections shall be supplied for sixty (60) inch to forty-eight (48) inch diameter transitions. Conical transitions shall be thirty-two (32) inches high. Sixteen (16) inches high conical transitions may be used only when approved by the **County**. All conical transition sections shall be supplied with a Manhole Lift System as manufactured by Press-Seal Gasket Corporation. Flat slab transitions shall be supplied for base sections seventy-two (72) inches to ninety six (96) inches in diameter. Flat slab transitions shall be manufactured structurally to meet individual project requirements. Clear access openings shall be provided to accommodate riser sections as shown in the Plans or as detailed in the Detail Drawings.
- J. Conical sections shall be wet or dry cast, eccentric only. Concentric sections shall not be allowed. Conical sections shall transition from forty-eight (48) inches in diameter to a twenty-four (24) inch clear access opening and be thirty-six (36) inches high. They shall be supplied with a Manhole Lift System as manufactured by Press-Seal Gasket Corporation
- K. Precast manhole riser joints shall be offset tongue and groove type, supplied with Tylox Super Seal pre-lubricated gasket as manufactured by Hamilton Kent. Each joint shall also be supplied with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants, in widths as recommended by the manufacturer.
- L. The ends of each reinforced concrete manhole riser section and the bottom end of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous uniform manhole.
- M. Standard manholes of precast concrete construction, and other manholes of precast concrete construction having entering sewers of twenty-four (24) inches in diameter or smaller shall have precast openings in the manhole walls for incoming or outgoing sewers as indicated on the Plans.
- N. All components of a manhole for a particular location shall be clearly marked in order that the manhole may be correctly assembled to suit construction conditions existing at that particular location.

- O. All precast concrete manhole base sections and drop manhole bases shall be set on a foundation of #57 compacted stone aggregate, twelve (12) inch minimum thickness, and covering the entire bottom of the excavation for the manhole. Aggregate size may be adjusted by the **County** based on field conditions.
- P. Manhole steps shall conform to the requirements of this section.

2.02 STRUCTURAL MATERIALS AND CASTINGS

- A. Structural steel shall conform to the requirements of ASTM A283, unless otherwise indicated on the Plans.
- B. Steel castings shall conform to the requirements of ASTM A27. The grades to be used shall be specified in the Special Conditions or indicated on the Approved Plans.
- C. Gray iron castings shall conform to the requirements of ASTM A48. All castings shall be clean and free of scale, adhesions, or inclusions. Gray iron castings for manhole or inlet frames and covers or gratings shall be cast from Class 30B cast iron. Bearing surfaces between manholes, inlet frames, and covers or gratings shall be such that the cover or grating shall seat in any position onto the frame without rocking. Bearing surfaces for standard manhole frames and covers shall be machined.
- D. Aluminum castings shall conform to the requirements of ASTM B108.
- E. Structural aluminum shall conform to the requirements of ASTM B209, B221, B308, B241, or B211, as applicable. Finished bolts and nuts shall be given an anodic coating of at least 0.0002 inches in thickness.

2.03 FRAMES, COVERS, AND STEPS

- A. New manhole rims, toe pockets, frames, and covers shall be cast iron conforming to the requirements of ASTM A48 for Class 30 Gray Iron Castings. All castings shall be made accurately to the required dimensions, fully interchangeable, sound, smooth, clean, and free from blisters or other defects. Defective castings that have been plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned and painted or coated with bituminous paint. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
- B. Manhole frames and covers shall be as detailed on the Plans, and as manufactured by Vulcan Foundry, or as manufactured by the Griffin Foundry Co., Russell Pipe and Foundry Co., or approved equal. Manhole covers shall be vented except those located within the one hundred (100) year flood plain, within three (3) feet of curb for a two (2) lane road, or within the outside lane of a multi-lane road.
- C. Sanitary sewer manhole covers shall have the words cast on the top in letters two (2) inches high per the **County** Standard Detail.

- D. Manhole steps shall NOT be included

2.04 SPECIALTY ITEMS

- A. One-piece manholes shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing four thousand (4,000) psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less. They shall be manufactured within a minimum eight (8) inches thick base with dowel steel reinforcement and waterstop. They shall be used only in situations that will not accommodate a twenty-four (24) inch base section and twenty-four (24) inch conical section.
- B. Manhole Tees measuring thirty-six by forty-eight (36 x 48) inches shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.
- C. Saddle manholes shall be manufactured in accordance with the requirements of ASTM C478 and as shown in the Detail Drawings. They shall be cast utilizing four thousand (4,000) psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.
- D. Drop Manholes (Memphis Tees) shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing four thousand (4,000) psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.

2.05 NOT USED

2.06 CONCRETE

- A. Concrete shall conform to requirements of Section 03300 - Cast-In-Place Concrete.

2.07 NOT USED

PART 3 - EXECUTION

3.01 GENERAL

- A. All activities shall be performed in accordance with the manufacturer's recommendations and regulations established by OSHA. Particular attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.
- B. The **Contractor** shall verify that lines and grades are as specified in the Plans.

3.02 INSTALLATION

- A. Manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings and at the locations shown on the Plans. They shall be constructed of precast concrete sections conforming to the requirements of this section. The manholes shall be assembled with the fewest number of sections to make up required height, thereby reducing the number of joints. The composition of the manhole shall be approved by the **County**. The **County** may require any manhole that is not composed of the minimum number of sections to be replaced. The depth of the manhole will vary with the location but in all cases, it shall be such as will place the cover (or lid) at the finished grade of the pavement or ground surface or as otherwise indicate on the Plans. In undeveloped or rural areas, manholes shall be furnished to a height of two (2) feet above ground. Concentric cone sections and flat top manholes, except for shallow depth where approved by the **County**, shall not be allowed; only eccentric cones shall be used.
- B. Precast concrete manholes for reinforced concrete sewers forty-eight (48) inches in diameter and larger shall be as specified above, except that they shall be installed on a saddle constructed on the barrel of the sewer. Precast concrete manholes for sewers of thirty (30), thirty-six (36), and forty-two (42) inches shall be saddle-types or precast base types as specified in the Plans. Reinforcing steel in the saddle shall be welded to the reinforcing steel of the pipe. The design of these saddles shall be approved by the **County** prior to manufacture.
- C. All joints for precast manhole stacks shall be offset tongue and groove with Tylox Super Seal pre-lubricated gaskets as manufactured by Hamilton Kent. Each joint shall also be sealed with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants. The width and installation of the joint sealant shall be in accordance with the manufacturer's recommendations. All joints shall be supplied with three inches by sixteen inches by one-half inch (3" x 16" x ½") bitumastic coated steel strap anchors. Three (3) strap anchors, one-hundred, twenty (120) degrees apart, shall be required per joint.
- D. Where the difference in the invert elevation of two (2) or more sewers, eighteen (18) inches in diameter or smaller, intersecting in one (1) manhole is two (2) feet or more, a Drop Manhole shall be constructed in the manner shown in the Detail Drawings. They shall be similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed with an outside or inside drop in the manhole as directed by the **County** and if required supported by Class B concrete as indicated on the Plans and in the Detail Drawings. The manhole and the drop connection shall be placed on twelve (12) inch reinforced concrete base as detailed in the Detail Drawings. The drop connection piping assembly shall be bolted to the barrel of the manhole riser using a minimum diameter of four (4) five-eighths (5/8) inches Type 316 stainless steel bolts with suitable washers to prevent failure caused by pulling the bolt head through the manhole wall.
- E. Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as shown on the Plans, and as detailed in the Detail Drawings. Manhole inverts shall be constructed of cement mortar and shall have

the same cross-section as the invert of the sewers that they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.

- F. All water standing in the trench shall be removed before placing of concrete is started, and the foundation maintained in a dry condition.
- G. Shallow manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings, and at the locations shown on the Plans. They shall be constructed of precast concrete sections as shown on the Plan and as directed by the **County**.
- H. The top elevation of manhole frames shall be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated on the Plans. A maximum adjustment of twelve (12) inches shall be allowed using brick and mortar. Adjustments greater than twelve (12) inches shall be made by changing precast riser sections or as directed by the **County**. Brick used shall be in accordance with the requirements of this Section.

3.03 PIPE CONNECTIONS AT MANHOLES

- A. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored and after installation sealed with an approved non-shrink grout only if an approved flexible manhole connector cannot be used. The method shall be compatible with the incoming and outgoing sewer pipe material to seal leakage. These manholes shall be installed on chocked and compacted stone bedding as shown in the Detail Drawings.
- B. A flexible manhole connector shall be the method of sealing the space between the manhole wall and the pipe. Flexible manhole sleeves shall be required for all pipes eighteen (18) inches and smaller. The manhole connector shall be Kor-N-Seal or equal and conform to the requirements of ASTM C923 and shall be made from ethylene propylene rubber (EPDM) designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils, and petroleum products. Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to the requirements of ASTM C923 and ASTM A167.
- C. All stainless steel elements of the manhole connector shall be totally non-magnetic Type 304 Stainless, excluding the worm screw for tightening the steel band around the pipe that shall be Type 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier, and set for sixty to seventy (60 to 70) inch/pounds. The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer. The connector shall be of a size specifically designed for the pipe material and size being utilized on the Project.

3.04 BACKFILL

- A. The **Contractor** shall place and compact backfill materials in the area of excavation surrounding manholes in accordance with the requirements of Section 02200 - Earthwork.

3.05 CLEANUP

- A. After the manhole installation Work has been completed and all testing accepted by the **County**, the **Contractor** shall clean up the area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the **Contractor** in a lawful manner. Disturbed grassed areas shall be seeded or sodded. Site restoration shall be performed in accordance with the requirements of Section 02920 - Site Restoration.

+++END OF SECTION 02641+++

SECTION 02665 WATER 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 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 ASTM International (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. Galvanized pipe/fittings shall not be used as any part of the Water Transmission and Distribution System, nor shall it be used to join any appurtenances to the System.
- D. Water mains, valves, hydrants, and appurtenances shall be installed before the installation of the sub-base course or paving or any other utilities except sanitary sewer lines.
- E. All water system products and materials shall be submitted for approval by the **County**. Each shall meet all design and operating requirements of the **County**.
- F. Related Work Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 01550 - Traffic Regulation
 - 3. Section 02000 – Site Work
 - 4. Section 02140 - Dewatering
 - 5. Section 02324 - Trenching and Trench Backfilling
 - 6. Section 02510 - Pavement Repairs
 - 7. Section 02521 - Concrete Sidewalks, Curbs, and Gutters
 - 8. 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 two (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 International, 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. All materials dropped or dumped shall 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 pipes 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 shall 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; plain end-bell. At least two (2) 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 pipes 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 shall ensure proper use with respect to types and sizes.

1.06 WATER MAIN LOCATION

- A. Except as otherwise shown on the Plans, the minimum depth of cover shall be four (4) feet and the maximum cover shall be five (5) feet. All 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, i.e., "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 eighteen (18) to twenty (20) feet. Sizes shall be as shown on the Plans. All pipe shall have a minimum pressure rating as indicated in following Table below, and corresponding minimum wall thickness, unless otherwise shown on the Plans, specified in these Specifications, or approved by the **County**.

Pipe Sizes	
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 zinc coated and 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 two-hundred and fifty (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 the Table below, unless approved by the **County**. No field welding of restrained joint pipe shall be allowed.

Acceptable Restrained Joints				
Diameter (inches)	ACIPCO	U.S. Pipe	McWayne	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 thirty-six (36) feet and as approved by the **County**
 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 one-eighth ($\frac{1}{8}$) 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 twenty-four (24) inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. All welding shall be performed by a certified welder and approved by the **County**. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 [Pressure Class 350 for sixty (60) and sixty-four (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 five hundred (500) psi or as approved by the **County**. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in the following table:

Maximum Outlet Diameters	
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. Acceptance shall be based on 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 twenty-four (24) inches not fabricated from centrifugally lined straight sections shall require two (2) inches by four (4) inches by thirteen (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 sixteen (16) mils in not less than two (2) 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 fifty (50) mils for pipe twenty-four (24) inches and smaller and not less than eighty (80) mils for pipe twenty-six (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 approved 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 twelve (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 or approved equal

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. All fittings less than or equal to 1" shall be flared unless otherwise approved by the **County**.

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 ACIPCO A10180 or U.S. Pipe U 592 or approved equal.
- 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; twenty-four (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.
- 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, and "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 two (2) inches when buried less than ten (10) inches below the surface. Tape width shall be a minimum of three (3) inches when buried greater than ten (10) inches and less than twenty (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 (2) 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 approved equal.
- 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 (3) way four and one-half ($4\frac{1}{2}$) inch valve, and left opening type.
 - 2. Internal main valve diameter shall be a minimum of five and one quarter ($5\frac{1}{4}$) 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, seven eights ($\frac{7}{8}$) 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 shall 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 shall 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 (2) "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 (2) internal and two (2) 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 six (6) inch mechanical joint connection complete with accessories.
11. Barrel extension sections shall be available in six (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 (2) two and one-half (2½) inch hose nozzles one-hundred and twenty (120) degrees apart and one (1) four and one half (4½) inch pumper nozzle. The threads shall be national standard threads. The nozzle caps shall be secured to fire hydrant with non-kinking 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: Fire hydrants Traffic design.

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 shall 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 six (6) inches, nor more than twelve (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 four (4) inches in diameter, shall be placed around the base of the fire hydrant for a depth of thirty (30) inches from the bottom of the trench and shall extend for a distance of thirty (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 (2) 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 (2) coats of Koppers primer 621 or approved equal. After installation, each hydrant shall be painted with two (2) field coats of Koppers Glamortex Enamel as manufactured by the Sika 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: six (6) inch or eight (8) inch mains shall be silver; ten (10) inch or twelve (12) inch mains shall be yellow; and sixteen (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 (1) standard four (4) sided hydrant wrench for each ten (10) 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**. The Certificate of Compliance shall be furnished to the **County**.

2.08 GATE VALVES (GV)

- A. Twenty (20) 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 twelve (12) inches in diameter shall have a minimum rated working pressure of two hundred (200) psi. Sixteen (16) inch and twenty (20) inch valves shall have a minimum rated working pressure of one hundred and fifty (150) psi.
 3. Valves less than four (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 four (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 (24) 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 one-hundred and fifty (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 twenty-four (24) inches in diameter and larger shall be manufactured by American R/D Gate Valve Company, Mueller, M & H Valve, or approved equal.

2.09 BUTTERFLY VALVES (BV)

- A. Unless indicated on the Plans to be two-hundred and fifty (250) pound 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 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 two-hundred and fifty (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 two-hundred and fifty (250) psi.
 2. The hydrostatic test shall be performed at a pressure of five-hundred (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 four-hundred and fifty (450) foot pounds of input torque in either the open or the 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.
- J. All butterfly valves shall be installed in an approved structure. The structure shall meet the applicable requirements within Section 02607 Manholes, Junction Boxes, and Inlets. The structure design shall be submitted to the **County** for approval.

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 (2) piece screw type with drop covers. Valve boxes shall have a five and one-quarter (5¼) inch inside diameter. Valve box covers shall weigh a minimum of thirteen (13) pounds. The valve boxes shall be adjustable to six (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 four (4) feet deep, to bring the operating nut to within twenty-four (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 approved 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 twelve (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 twelve (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 two-hundred and fifty (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 seventy-two (72) hours [three (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 ten (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 two-hundred (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 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 twelve (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 shall maintain a minimum ten (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 ten (10) foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of eighteen (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 eighteen (18) inches.
 2. The water main, when installed below the sewer, shall be encased in concrete with a minimum six (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 Georgia Department of Transportation (GDOT) 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 GDOT-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 GDOT and the **County** a minimum of forty-eight (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 GDOT 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 insure 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 pipe line 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 four hundred (400) feet along areas, including clean up 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 Erosion and Sedimentation requirements of Section 02125.

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 shall not interfere with traffic.
- B. No pipe shall be strung further along the route than one-thousand (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 two-hundred (200) feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- C. No street or roadway shall 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 five (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** 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 twelve (12) inches in diameter. Detection tape shall be buried four (4) to ten (10) inches deep. Should detection tape need to be installed deeper, the **Contractor** shall provide three (3) inch wide tape. In no case shall detection tape be buried greater than twenty (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 one-thousand (1,000) feet on either side of main line valves to insure one-hundred (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" one-hundred (100) percent.
4. The **Contractor** shall internally inspect each pipe joint to insure proper assembly for pipe twenty-four (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 twelve (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 shall 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 shall 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 six (6) inches inside the right of way or easement, and buried to a depth of thirty (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 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 to induce a test pressure as specified in this section. No leakage shall be permitted for a period of five (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 one (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 pipe line.
- 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. All 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 ninety (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 **County DWM** facilities. 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 **County DWM** Applications Office.
- C. Each segment of water main between main valves shall be tested individually. No payment will be made for sections of pipe that have not passed pressure test.
- D. Test Preparation:
 - 1. For water mains less than twenty-four (24) inches in diameter, the **Contractor** shall flush sections thoroughly at flow velocities, greater than two and one-half (2½) feet per second, adequate to remove debris from pipe and valve seats. For water mains twenty-four (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 assure 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 two-hundred and fifty (250) psi measured at the lowest point for at least two (2) hours. The **Contractor** shall maintain the test pressure within five (5) psi of the specified test pressure for the test duration. Should the pressure drop more than five (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 gauge with graduation not greater than five (5) psi.
- F. Leakage:
1. Leakage shall be defined as the sum of the quantity of water that shall be pumped into the test section, to maintain pressure within five (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 pressure during the test (psi, 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 twenty-five (25) milligrams per liter free chlorine in new line. The **Contractor** shall retain chlorinated water for twenty-four (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 than ten (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 twenty-four (24) hour period.
 - 3. After twenty-four (24) hours, all samples of water shall contain at least ten (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 chlorine residual of disinfection water to less than one (1) milligram per liter if discharged directly to a body of water or to less than two (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 (1) set of samples shall be collected from every one-thousand and two-hundred (1,200) feet of water main, plus one (1) set from each end of main and one (1) set from each branch. If the test results are not acceptable, the **Contractor** shall re-chlorinate lines at its 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 02510 and 02521. 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**. All 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 thirty (30) days to allow proper natural watering of the root system. The **Contractor** shall repair any damaged tree over three (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 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 shall 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 the abandoned water mains.
- 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 six- (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 Section 02510 - Pavement Repairs and the approved plans.

+++ 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 ASTM International (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. All water system products and materials shall be submitted for approval by the **County**. Each shall meet all design and operating requirements of the **County**.
- E. Related Work Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 01550 - Traffic Regulation
 - 3. Section 02000 - Site Work
 - 4. Section 02140 - Dewatering
 - 5. Section 02324 - Trenching and Trench Backfilling
 - 6. Section 02510 - Pavement Repairs
 - 7. Section 02521 - Concrete Sidewalks, Curbs, and Gutters
 - 8. 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 ten (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 International 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. All materials dropped or dumped shall 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 shall 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 (2) 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 shall ensure proper use with respect to types and sizes.

1.06 WATER MAIN LOCATION

- A. The minimum depth of cover shall be four (4) feet and the maximum cover shall be five (5) feet. All 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 (i.e., "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 eighteen (18) to twenty (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, 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 zinc coated and 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 two-hundred and fifty (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 below. Unless approved by the **County** no field welding of restrained joint pipe shall be allowed.

Acceptable Restrained Joints				
Size	ACIPCO	U.S. Pipe	McWayne	Generic⁽¹⁾
4 – 12	Fast-Grip Flex-Ring	TR Flex Field Lok, (Mueller)	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 – 24	Fast-Grip Flex-Ring	TR Flex Field Lok, (Mueller)	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 thirty-six (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 one-eighth ($\frac{1}{8}$) 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.
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 twenty-four (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 sixty (60) and sixty-four (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 five hundred (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 below:

Maximum Outlet Diameters	
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 two hundred and fifty (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 twenty-four (24) inches not fabricated from centrifugally lined straight sections, shall require two (2) inches by four (4) inches by thirteen (13) gauge 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 be an amidoamine as well as the other curing agents listed in AWWA C210
- c. The coating shall be applied to a minimum thickness of sixteen (16) mils in not less than two (2) 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 fifty (50) mils for pipe twenty-four (24) inches and smaller and not less than eighty (80) mils for pipe twenty-six (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; twenty four (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 shall not be used 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 two (2) inches when buried less than ten (10) inches below the surface. Tape width shall be a minimum of three (3) inches when buried greater than ten (10) inches and less than twenty (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: As stated on the approved plans.
 2. Interior: As stated on the approved plans.
- 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 the Table below.

Minimum Wall Thickness	
Nominal Diameter (Inches)	Wall Thickness (Inches)
24 and Smaller	1/4
26 through 36	3/8
38 through 60	1/2

- 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 all 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 four (4) inches and a maximum of six (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, one-eighth (1/8) inch thick, in one piece, fullcut 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. Flexible coupling shall be Rockwell No. 411 or Dresser No. 38.

3. Middle ring length shall be seven (7) inches for pipes through thirty (30) inches in diameter and ten (10) inches for pipes larger than thirty (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 approved plans or as directed by the **County**.

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 two (2) layers totaling seventy (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 twelve (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.

2.03 FIRE HYDRANTS

- A. General: Fire hydrant shall be a two (2) 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 approved equal.
- 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 (3) way four and one half (4½) inch valve, and left opening type.
 2. Internal main valve diameter shall be a minimum of five and one quarter (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 shall 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 shall 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 hydrant main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze-to-bronze thread engagement. Two (2) "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 (2) internal and two (2) 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 six (6) inch mechanical joint connection complete with accessories.
11. Barrel extension sections shall be available in six (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 (2) two and one half (2½) inch hose nozzles one-hundred and twenty (120) degrees apart and one (1) four and one-half (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 shall 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 six (6) inches, nor more than twelve (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 four (4) inches in diameter shall be placed around the base of the fire hydrant for a depth of thirty (30) inches from the bottom of the trench and shall extend for a distance of thirty (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 (2) 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 (2) coats of Koppers primer 621 or approved equal. After installation, each hydrant shall be painted with two (2) field coats of Koppers Glamortex Enamel as manufactured by the Sika 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: six (6) inch or eight (8) inch mains shall be silver; ten (10) inch or twelve (12) inch mains shall be yellow; and sixteen (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 (1) standard four (4) sided hydrant wrench for each ten (10) 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**. Certificate of Compliance shall be furnished to the **County**.

2.04 GATE VALVES (GV)

- A. Twenty (20) 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 twelve (12) inches in diameter shall have a minimum rated working pressure of two hundred (200) psi. Sixteen (16) inch and twenty (20) inch valves shall have a minimum rated working pressure of one-hundred and fifty (150) psi.
 3. Valves less than four (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 four (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 (24) 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 one-hundred and fifty (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 twenty-four (24) inches in diameter and larger shall be manufactured by American R/D Gate Valve Company, Mueller, M & H Valve or equal.

2.05 VALVE BOXES (VB) AND EXTENSION STEMS

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two (2) piece screw type with drop covers. Valve boxes shall have a five and one-quarter (5¼) inch inside diameter. Valve box covers shall weigh a minimum of thirteen (13) pounds. The valve boxes shall be adjustable to six (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 U.S.
- B. All valves shall be furnished with extension stems if operating nut is greater than four (4) feet deep, to bring the operating nut to within twenty-four (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.

2.06 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".

2.07 TAPPING SLEEVES AND VALVES (TS&V)

- A. Tapping sleeves for mains twelve (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 twelve (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 two-hundred and fifty (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.

2.08 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 **two weeks** 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 ten (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 two-hundred (200) feet in advance of pipeline construction, to verify its true location and grade. The **Contractor** shall repair, or have repaired, all 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 biweekly, 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 twelve (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 Separation:

1. Water mains shall maintain a minimum ten (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 ten (10) foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of eighteen (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 eighteen (18) inches.
2. The water main, when installed below the sewer, shall be encased in concrete with a minimum six (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 GDOT-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 GDOT and the **County** a minimum of forty-eight (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 GDOT 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 four hundred (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. Erosion and Sedimentation Control measures shall be maintained and the **Contractor** is subject to clean any storm line and or manhole 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 shall not interfere with traffic.
- B. No pipe shall be strung further along the route than one-thousand (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 two-hundred (200) feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

- C. No street or roadway shall 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 five (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 twelve (12) inches in diameter. Detection tape shall be buried four (4) to ten (10) inches deep. Should detection tape need to be installed deeper, the **Contractor** shall provide three (3) inch-wide tape. In no case shall detection tape be buried greater than twenty (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 one-thousand (1,000) feet on either side of main line valves to ensure one-hundred (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” one-hundred (100) percent.
 4. The **Contractor** shall internally inspect each pipe joint to ensure proper assembly for pipe twenty-four (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 twelve (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 shall 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 shall 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 six (6) inches inside the right-of-way or easement, and buried to a depth of thirty (30) inches.

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. Existing Pipelines: 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 to induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five (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 one (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 pipe line.
- 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. **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 ninety (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 collars 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 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 **County DWM** facilities. 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 **County DWM** Applications Office.
- C. Each segment of water main between main valves shall be tested individually. No payment will be made for sections of pipe that have not passed pressure test.
- D. Test Preparation:
1. For water mains less than twenty-four (24) inches in diameter, the **Contractor** shall flush sections thoroughly at flow velocities, greater than two and one-half (2½) feet per second, adequate to remove debris from pipe and valve seats. For water mains twenty-four (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 two-hundred and fifty (250) psi measured at the lowest point for at least two (2) hours. The **Contractor** shall maintain the test pressure within five (5) psi of the specified test pressure for the test duration. Should the pressure drop more than five (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 five (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 five (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 pressure during the test, psi (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 twenty-five (25) milligrams per liter free chlorine in the new line. The **Contractor** shall retain chlorinated water for twenty-four (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 ten (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 twenty-four (24) hour period.
 - 3. After twenty-four (24) hours, all samples of water shall contain at least ten (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 one (1) milligram per liter if discharged directly to a body of water or to less than two (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 Georgia EPD rules. The **County** reserves the right to collect and test the samples in the **County's** laboratory. One (1) set of samples shall be collected from every one-thousand two-hundred (1,200) feet of water main, plus one (1) set from each end of main and one (1) set from each branch. If the test results are not acceptable, the **Contractor** shall re-chlorinate lines at its 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 02510 and 02521. 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**. All 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 thirty (30) days to allow proper natural watering of the root system. The **Contractor** shall repair any damaged tree over three (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 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 shall 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 six- (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 Section 02510 - Pavement Repairs and approved plans.

+++ END OF SECTION 02665T +++

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 that 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 01210 - Measurement and Payment
 - 2. Section 02200 - Earthwork
 - 3. Section 02231 - Tree Protection and Trimming
 - 4. Section 02324 - Trenching and Trench Backfilling
 - 5. Section 02510 - 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. 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** shall 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 that shall 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 shall 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 below:

Grass Seed Quality			
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 shall be acceptable with a date of test more than six (6) months prior to the date of sowing. Such testing, however, shall 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 that has become wet, moldy, or otherwise damaged shall 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 that is caked or otherwise damaged, making it unsuitable for use, shall 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 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: Nine (9.0%) percent $\pm$ 3.0 percent.
 2. Percent organic matter: Nine and two-tenths (9.2%) percent $\pm$ 0.8 percent.
 3. Percent ash content: One and eight-hundredths (1.08%) percent $\pm$ 0.2 percent.
 4. pH: four and eight tenths (4.8) ($\pm$ 0.5).
 5. Water holding capacity: one thousand one hundred fifty (1150) grams water/ one hundred (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 the table below for seasonal application rates:

Seasonal Seed Application Rates		
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" will 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 - Earthwork

3.02 GROUND PREPARATION

- A. All ground to be sodded, sprigged, overseeded, 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 two thousand (2,000) pounds per acre. Commercial grade five (5) percent nitrogen-ten percent phosphorus – ten percent potassium (5-10-10) fertilizer or approved equal shall also be uniformly spread over the area at the rate of one thousand five hundred (1,500) 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: 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 that 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 shall produce a uniform application of the seed. The **Contractor** shall not distribute seed by hand.
- 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 that 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 one (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

seventy (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 thirty (30) days after sufficient moisture has been applied to make the first application available for plant growth. Second application shall also furnish seventy (70) pounds 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 shall be considered satisfactory by the **County** only if there is full cover over the seeded area with perennial grass that is alive and growing, leaving no bare spots larger than one (1) square foot or the total of all bare spots within a given area shall constitute no more than one one-hundredth (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 (*Cynodon dactylon*) or one of the following Bermudagrass varieties:
 - a. Tifway 419
 - b. Tifway II Hybrid
 - c. Tift 94
 - d. Tifton 10
 - e. Midlawn
 - f. Midiron
 - g. GN-1 Hybrid
 - h. Vermont
 - 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 will be needed 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 fifty (50) pounds/acre when specified by the **County** after plants have grown to two (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. Do not apply nitrogen on windy days or when foliage is damp. Do not apply nitrogen 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, workmanlike 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 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Concrete reinforcement and accessories.

1.02 REFERENCES

A. General:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.

B. ACI – American Concrete Institute:

1. ACI 117 Tolerances for Concrete Construction
2. ACI 301 Specifications for Structural Concrete
3. ACI 315 Standard Practice for Detailing Reinforced Concrete Structures

C. ASTM International:

1. ASTM A185 / A185M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
2. ASTM A615 / A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A706 / A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
4. ASTM A970 / A970M Standard Specification for Headed Steel Bars for Concrete Reinforcement

D. CRSI - Manual of Standard Practice.

- E. ICBO - Evaluation Reports.

1.03 SUBMITTALS

- A. Submit according to **01300 – Submittals**
- B. Shop Drawings: Prepare placing drawings in accordance with ACI 315. Show size, shape and location of bars and wire fabric in structure. Show splice locations and lengths. Where details are not shown, conform to standards of practice indicated in ACI 315 and submit for approval.
 - 1. Bill reinforcing bars for walls on elevations. Bill reinforcing bars for slabs on plans. Plans and elevations need not be true views. When more than one wall or slab is identical, only one such wall or slab is required. Take sections to clarify the arrangement of reinforcement. Identify, but do not bill bars on sections.
 - 2. Unless the location of reinforcing is clear, give dimensions to some structural feature that will be readily distinguishable at time bars are placed.
 - 3. Make placing drawings complete, including the location of support bars and chairs, without reference to the design drawings.
- C. Submit data required to evaluate proposed mechanical splices.
- D. Submit manufacturer's certified mill test reports on each heat of reinforcing steel delivered, showing physical and chemical analysis before placing reinforcement.

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of ACI 301 CRSI's "Manual of Standard Practice", except where more stringent requirements are shown or specified.
- B. Requirements of Regulatory Agencies: Proprietary products, including bar couplers, shall have an active ICBO Evaluation Report.
- C. Material Quality Assurance: Mill test reports including chemical analysis, tensile properties and bend test shall be examined for all reinforcing. Conform to one of the following:
- D. Maintain positive identification of reinforcing by heat number. Provide certified mill test reports to Testing Laboratory.
- E. Where positive identification cannot be made and procedures are not deemed adequate to ensure compliance, Testing Laboratory will randomly sample and make one tensile and one bend test from each 2-1/2 tons or fraction thereof of each size of reinforcement. Subcontractor will bear the cost of testing.

PART 2 - PRODUCTS

2.01 REINFORCING MATERIALS

- A. Bar Reinforcement: ASTM A615, Grade 60, deformed billet bars.
 - 1. ASTM A706, where noted on Drawings.
 - 2. Recycled content shall be a minimum of 75 percent recycled post consumer steel.
- B. Headed Bar Reinforcement: ASTM A970.
- C. Spirals: ASTM A82.
- D. Welded Wire Fabric: ASTM A185.
- E. Threaded Bars: Grade 75, manufactured by DYWIDAY Systems International, Williams Form Engineering Corp. or equal substituted per Division 1.
- F. Smooth Dowels, ASTM A615, Grade 40 or 60, smooth; sawcut or grind one end to remove offsets; shop paint with iron oxide zinc chromate primer.
- G. Welded Deformed Bar Anchors: ASTM A-108 $f_y = 70,000$ psi, flux-filled deformed bar anchors welded to structural steel as shown; Nelson D2L, or equal substituted per Division 1.
- H. Mechanical Bar Couplers: Provide mechanical couplers with a current ICC evaluation report. Coupler shall develop 160% percent of specified minimum yield strength of spliced reinforcement. Subject to compliance with requirements provide one of the following, or approved equal:
 - 1. Barteck, Dextra Inc.
 - 2. Lenton Taper Threaded Connection, Erico Inc.
 - 3. Bar Lock, Dayton Superior Inc.

2.02 ACCESSORIES

- A. Tie Wire: Minimum 16-gage black annealed wire.
- B. Bar Supports:
 - 1. At surfaces not exposed to view in completed structure: Precast concrete bar supports with two 16 ga. embedded wires or CRSI Class 2 wire supports.
 - 2. Supports placed against ground or on top of vapor barrier: Precast concrete blocks not less than 3 inches square (1935 mm²) with two 16 ga. embedded wires.
 - 3. At Architectural Concrete and surfaces exposed to weather: CRSI Class 2 stainless steel or CRSI Class 1 plastic protected.
 - 4. Where support is no closer to concrete surface than 1/2 inch (13 mm): CRSI Class 3 wire supports.

2.03 FABRICATION

- A. Fabricate reinforcement in accordance with ACI 315 where specific details are not shown.

PART 3 - EXECUTION

3.01 PLACEMENT

- A. Surface Condition of Reinforcement: Before placing concrete, clean reinforcement of loose scale, dirt, grease and other substances which would impair bond with concrete.
- B. Place reinforcement in accordance with the Drawings and the CRSI Manual.
 - 1. Steel bars shall be of size and length indicated, accurately bent or formed to shapes detailed or scheduled by experienced shops by methods that will not injure the materials. Reinforcing bars shall be shop fabricated to lengths and bends shown on the drawings. Fabrication tolerance shall be in accordance with the requirements of ACI 315.
 - 2. Reinforcing bars shall be as long as possible with a minimum number of joints.
 - 3. Steel reinforcement shall not be bent or straightened in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of reinforcement for bending will not be permitted.
 - 4. Reinforcement shall be tagged with suitable identification to facilitate sorting and placing.
- C. Place reinforcing bars accurately as to spacing and clearance and securely tied at intersections and supports with wire and in such a manner as will preclude displacement during pouring of concrete. Placing tolerances shall be in conformance with the requirements of ACI 117.
- D. Place and secure reinforcement to maintain the proper distance and clearance between parallel bars and from the forms. Provide vertical steel with metal spreaders to maintain steel properly centered in the forms. Horizontal reinforcement shall be supported at proper height on concrete pads, chairs or transverse steel bars.
- E. After placing, maintain bars in a clean condition until completely embedded in concrete.
- F. Bars shall not be spaced closer than 1-1/2 diameters of the largest of two adjacent bars, 1-1/2 times the maximum aggregate size, nor one inch, except at bar laps. Where reinforcement in members is placed in two layers, the clear distance between layers shall be not less than one inch (25 mm) or more than 1-1/2 inches (13 mm) unless otherwise noted on the drawings. The bars in the upper layer shall be placed directly above those in the bottom layer unless otherwise detailed.

- G. Coverage of bars shall be as shown and scheduled. Conform to ACI 301 where not indicated.
- H. Where obstruction prevents the intended placement of reinforcement, provide additional reinforcement as directed by the **County** around the obstruction.
- I. Splice bars as indicated by lapping and securely wiring together. Splices at locations other than those indicated are subject to the approval of the **County**. Splices of reinforcement shall not be made at the point of maximum stress. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear. Bars shall be spread the minimum distance specified. Stagger splices of adjacent bars where possible.
- J. Reinforcing bars shall not have welded joints.
- K. Mechanical Bar Couplers: Install in accordance with applicable ICC evaluation report. Maintain clearance and coverage at coupler. Stagger couplers wherever practical.

3.02 FIELD INSPECTION

- A. Testing Laboratory will:
 - 1. Review Quality Assurance procedures for maintaining identification of steel. Collect certificates of compliance and test reports for reinforcing steel.
 - 2. Special Inspect placement of reinforcement for conformance with the Contract Documents and as required by CBC Chapter 17.
 - 3. Special Inspect installation of mechanical couplers in accordance with requirements of applicable ICC evaluation report.
 - 4. Special Inspect shop and field welding as required by CBC Chapter 17

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 — GENERAL

1.01 SECTION INCLUDES

- A. This specification covers all Work, materials and equipment required for:
 - 1. Mixing and placing concrete.
 - 2. Protection of new work.
 - 3. Curing.
 - 4. Testing and inspecting concrete.
 - 5. Defective concrete.

1.02 RELATED SECTIONS

- A. Section 02510: Pavement Repairs
- B. Section 02521: Concrete Curbs, Gutters, and Sidewalks

1.03 REFERENCES

- A. ASTM C33 – “Standard Specification for Concrete Aggregates”
- B. ASTM C494 – “Standard Specification for Chemical Admixtures for Concrete”

1.04 SUBMITTALS

- A. Mix Designs: to contain portions of materials and admixtures to be used on Project, signed by mix designer, documentation of average strength for each proposed mix design and Manufacturer’s Certificate of Compliance.
- B. Test Reports for aggregates used in the mix design
- C. Admixtures: manufacturer’s catalog cut sheets and product data sheets for each admixture used in proposed mix design
- D. Product Data: Specified ancillary materials.
- E. Detailed plan for curing and protection of concrete placed and cured in cold weather. Details shall include, but not be limited to, the following:
 - 1. Procedures for protecting subgrade from frost and accumulation of ice or snow on reinforcement, other metallic embeds, and forms prior to placement.

2. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 3. Methods for temperature protection during placement.
 4. Types of covering, insulation, housing, or heating to be provided.
 5. Curing methods to be used during and following protection period.
 6. Use of strength accelerating admixtures.
 7. Methods for verification of in-place strength.
 8. Procedures for measuring and recording concrete temperatures.
 9. Procedures for preventing drying during dry, windy conditions.
- F. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F. Plan shall include, but not be limited to, the following:
1. Procedures for measuring, and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 2. Use of retarding admixture.
 3. Methods for controlling temperature of reinforcement and other embedded items and concrete materials before and during placement.
 4. Types of shading and wind protection to be provided.
 5. Curing methods, including use of evaporation retardant.
 6. Procedures for measuring and recording concrete temperatures.
 7. Procedures for preventing drying during dry, windy conditions
- G. Manufacturer's Certificate of Compliance to specified standards
- H. Statement of Qualification:
1. Batch Plant: Certification as specified herein.
 2. Mix designer.
 3. Installer.
 4. Testing agency.
- I. Field test reports

PART 2 - PRODUCTS

2.01 MATERIAL

- A. **Portland Cement:** Conform to ASTM "Standard Specifications for Portland Cement", C150, Type I/II. Use one brand of cement. Mix shall contain at least 520 lb. of Portland Cement per cubic yard of concrete.
- B. **Aggregates:** Conform to ASTM "Standard Specifications for Portland Cement", C33. Provide aggregate of natural sand and gravel or prepared from stone or gravel, free from adherent coatings, maximum size of pieces 1". Use pea gravel aggregate for concrete mix used in filling voids in concrete block walls where required.
- C. **Water:** Clean and free from injurious amounts of oils, acids, alkalis, organic materials, and deleterious substances. Non-potable water will not be used in concrete mixing.
- D. **Admixtures:** Conform to ASTM C494 "Standard Specification for Chemical Admixtures for Concrete"

2.02 CONCRETE STRENGTHS

- A. Cast-in-place Concrete: Designed to develop 3,000 psi minimum compressive strength at twenty-eight (28) days and 3,500 IF EXPOSED TO WEATHER, unless noted otherwise.
- B. Cast-in-place pavement uses will need to develop 4000 psi minimum compressive strength at twenty-eight (28) days.

PART 3 - EXECUTION

3.01 PREPARATION AND INSTALLATION

- A. Notify the **County** at least 1 full working day in advance before starting to place concrete
- B. Clean equipment for transporting concrete. Remove debris, water, and ice from places to be occupied by concrete. Remove laitance and unsound material from hardened concrete before additional concrete is added.
- C. No concrete shall be placed when mixed longer than ninety (90) minutes, has exceeded three hundred (300) truck drum revolutions, or evidence of curing prior to placement.
- D. Concrete, when deposited, shall have a temperature ranging between a minimum of 50° F and a maximum of 90° F.
- E. Falling concrete shall be closely confined in a drop chute of the proper size when drop is over four (4) feet, and the final drop must be vertical to avoid segregation of aggregates. In no case shall concrete be deposited from a height causing

separation of the aggregates.

F. Pumping of Concrete

1. Provide standby pump, conveyor system, crane and concrete bucket, or other system onsite during pumping, for adequate redundancy to ensure completion of concrete placement without cold joints in case of primary placing equipment breakdown.
2. Minimum pump hose diameter: 4 inches
3. Replace pumping equipment and hoses that are not functioning properly.

G. Concrete shall be mixed in such quantities as required for immediate use and shall be placed while fresh before loss of slump occurs. Re-tempering by adding water to restore slump lost during excessive mixing or due to too long a lapse of time since initial mixing will not be permitted.

H. Concrete shall be rodded or vibrated to remove excess voids and air pockets when applicable.

3.02 POST INSTALLATION

A. All freshly placed concrete shall be adequately protected from mechanical injury or by action of the elements until such time as the concrete is thoroughly set.

B. Curing

1. Curing shall be performed on all concrete surfaces not immediately back-filled when hard.
2. Curing shall be started immediately upon completion of the finishing operation. Curing shall continue uninterrupted for a minimum period of seven (7) days unless a longer period is hereinafter specified. Rapid drying upon completion of the curing period shall be prevented. At no time during the curing period shall the temperature of the concrete be permitted to drop below 40° F.
3. Curing may be by water curing, sheet or liquid membrane. Do not use liquid membrane where a later concrete or masonry joint may occur unless the material has been certified as a non-bond breaker.

3.03 TESTING

A. Four (4) test cylinders shall be molded each day for each fifty (50) cubic yards or fraction thereof. A slump and air test shall be made for each set of cylinders and whenever the concrete appears to vary in consistency.

B. Mold and cure test cylinders in accordance with ASTM C-31 or PTM 611.

1. Test one (1) cylinder at seven (7) days. If break does not meet specification, break two (2) cylinders at twenty-eight (28) days for acceptance.
2. The remaining cylinder shall be kept for reference or additional testing if required.

C. Slump

1. Prior to submitting mix design, consult with concrete producer and select a target slump value at point of delivery, for each application of each design mix. Unless otherwise permitted, target slump value will then be enforced for duration of project. Unless otherwise permitted, target slump value is 4 inches at point of delivery, for concrete without high-range, water-reducing admixture.

- D. Source Quality Control Inspection: The **County** shall have access to and have the right to inspect batch plants, cement mills, and supply facilities of suppliers, manufacturers, and Subcontractors, providing products included in this section.

3.04 ACCEPTANCE

- A. Defective concrete is defined as concrete in place not conforming to strength, shapes, alignments and/or elevations as specified or shown on the Drawings.
- B. All defective concrete shall be removed and replaced in a manner meeting specification at no additional cost to the **County**.

END OF SECTION