(Revised March 16, 2021)

Exhibit 1
Technical Specifications

DeKalb County

Department of Watershed Management

DeKalb County
GEORGIA

Kensington Road Pump Station and Pipeline Project
ITB: 21-101330

ENGINEER:
RIVER TO TAP

PREPARED FOR:
DeKalb County Department of Watershed Management
DEKALB COUNTY, GEORGIA
November 2020

Technical Specifications

For information regarding this project contact:

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SEALS

Specification Sections

Division 01	Division 02	Division 09	Division 10
01001	02000	09900	10430
01010	02020		
01011	02050		
01014	02060		
01016	02110	Division 11	Division 15
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01040	02125	11020	15056
01045	02140	11303	15100
01056	02200		
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01510	02609		
01540	02641		
01550	02650		
01600	02665		
01610	02711		
01650	02750		
01664	02920		
01700			
01800			

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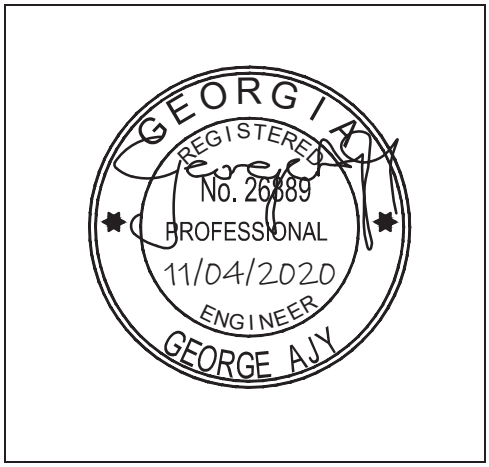

Georgia Certificate of Authorization
R2T, Inc.
License No.: PEF004653
Expiration Date: 6/30/2022

SEALS

Specification Sections

Division 01	Division 03	Division 05
01450	03200 03300	05500

Division 10	Division 14
10730	14650

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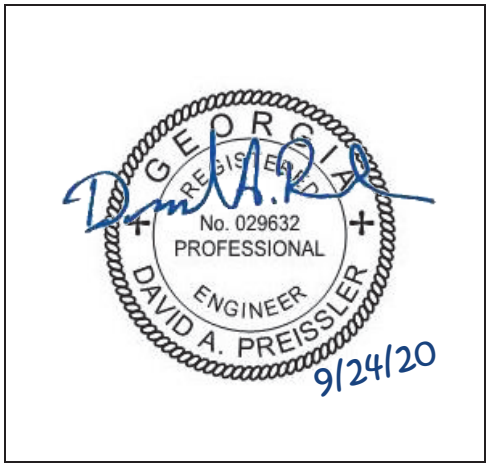

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SEALS

Specification Sections

Division 16	Division 17
16000	17000
16050	17100
16111	17120
16120	17200
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16160	17950
16231	
16455	
16950	

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Division 17 – Instrumentation and Controls

SECTION 01001

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SCOPE

A. This contract for the Kensington Road Pump Station and Pipeline consists of constructing a new pump station, associated piping, access road, utilities, fencing, lighting, demo, site clearing/grubbing and all other items required by the Drawings or Specifications to complete the Work.

B. Major portions of the Work consist of, but are not limited to, the following items:

   a. Construction of pump station

   b. Construction of new access road

   c. Installation of wet well and associated pumps and piping

   d. Demolition of existing gravity mains and manholes, fencing and clearing as required

   e. Installation of gravity main influent pipe connecting existing County sanitary system and influent pipe on Medical Examiner's side

   f. Force main piping extending from the valve vault at the pump station to downstream manhole

   g. New lateral pipe from Medical Examiner's office to tie into gravity sewer

   h. Installation of receiving manhole at pump station

   i. Fencing with slide gate

   j. Installation of electrical controls, wiring, conduit, and generator

   k. Installation of control panel canopy and site lighting

   l. All associated utilities (water, gas, electric)

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 execute 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 indicated on the Approved Drawings.

1.03 PROJECT MILESTONES

The Contractor shall be required to complete the following activities by the indicated date or days after the Notice to Proceed:

Date / Consecutive Calendar Days after Notice to Proceed	Milestone	Liquidated Damages Per Calendar Day
335	Substantial Completion* of All Other Work	$2000
365	Final Completion* of All Work	$2500

*As defined in Specification

1.04 WORK COVERED BY THE CONTRACT DOCUMENTS

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

1.05 WORK COORDINATION

A. The **Contractor** shall coordinate the Work with third parties (such as 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.

C. For Work items outside of the Work encompassed by the “Base Bid”, the **County** will work with the **Contractor** to assign and schedule the Work in a logical and efficient format. However, the items in this contract shall be priced such that each item may be assigned independently or combined with other items at the **County**’s sole discretion in regard to both quantity and scope. The **Contractor** shall perform only those work items directed by the **County** at the unit prices specified herein.

D. The **County** will track progress of the Work with project milestones that will be provided to the **Contractor**. Substantial completion and Final completion will be specified as a set number of days within which the **Contractor** must complete the Work.

1.06 CONDITIONS AT THE SITE

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**.

F. The Contractor is responsible for control of traffic per all current governing regulations and standards at no additional cost to the County

END OF SECTION

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. If the **Contractor** deems additional permitting and access are required, then they 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 - Photographic Documentation** 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 as well as electronic files in approved format

3. 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 **Contracto**r, 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 Night work from 10 p.m. until 7 a.m. shall require an approved special permit from the **County**.	 70 dBA 60 dBA 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.

J. Odor Control

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

3.05 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

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. It should be noted the Work location is directly adjacent to critical County infrastructure and facilities.

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 Work Sequence** and **Section 01300 Submittals** 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.

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 after a Shutdown Plan has been reviewed and approved by the **County**.

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

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 wastewater collection system is currently and continuously receiving wastewater. 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 collection 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.

3. Never bypass untreated or partially treated sewage to surface waters or drainage courses. This is strictly prohibited during construction. If the **Contractor's** operations cause accidental bypassing, the **County** shall immediately be entitled to employ others to stop the bypassing and shall be entitled to do so without written notice to the **Contractor**.

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 preventing bypassing, the length of time required to complete said operation, the affected facility(ies), and the equipment the **Contractor** shall provide in order to prevent bypassing.

B. Sequence Submittal: The sequence provided in Part 3 of this Section is offered as a suggestion to the **Contractor**. The **Contractor** shall submit 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 wastewater collection 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 plan 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 in the facilities. The five stages are:

Stage 1 – Preparatory- Permits/Demo/Clearing and Grubbing/Controls/Initial Erosion Control, etc.

Stage 2 - Bypass Facilities

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

Stage 4 - Sitework

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 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, easements, permits, and other activities. The cost for these items shall be included in the **Contractor's** base bid.

END OF SECTION

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

SECTION 01020

ALLOWANCES

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. This section includes administrative and procedural requirements governing allowances. This Contract includes three (3) Allowances that may be used at the discretion of the **County**.

1.02 QUALIFICATIONS AND REQUIREMENTS

A. Contingency 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.

1.03 SCHEDULE OF ALLOWANCES

A. Additional Unit Price Items as Directed by Owner (Earthwork and Erosion/Sedimentation Control):

1. These items 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,

b. Work under this item will be accomplished utilizing pay items indicated in the Bid Tab.

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**.

B. **County** Directed Additional Work Cash Allowance:

1. Provides for related collection system work to be performed in conjunction with this project at the direction of the **County**.

a. All work performed under this section shall comply with these Contract Documents and appropriate industry standards.

b. Work covered under Cash Allowance:

1) Provided to the Contractor in:

a) **County's** written form,

b) By modifications to the Contract Documents

c) By supplemental exhibits.

2) No work will be allowed under this section without the prior written approval by the **County**.

2. Special Inspections and Testing

a. For code-required special inspections. See Section 01450, Special Inspections and Testing and Observations.

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

SECTION 01045

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DEFINITIONS

"Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other Work and subsequent fitting and patching required to restore surfaces to their original conditions.

A. Cutting and patching is performed for coordination of the Work, to uncover Work for access or inspection, to obtain samples for testing, to perform alterations, or for similar purposes.

B. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered "cutting and patching."

C. "Demolition" and "Selective Demolition" are recognized as related, but separate categories of Work, which may or may not require cutting and patching as defined in this section, refer to "Demolition" and "Selective Demolition" sections of Division 2.

1.02 SECTION INCLUDES

Unless otherwise specified, requirements of this section apply to site and electrical Work. Refer to Divisions 2 and 16 for additional requirements and limitations on cutting and patching of mechanical and electrical work. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of Work.

This Section includes:

A. Administrative and procedural requirements for cutting and patching

B. Reference to other sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work

1.03 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General Requirements and other Division 1 Specification Sections.

B. Requirements for mechanical and electrical installations and reference to Sections in Divisions 2 and 17 for other requirements and limitations applicable to cutting and patching mechanical and electrical installations

1.04 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load-deflection ratio.

Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems.

1. Primary operational systems and equipment
2. Air or smoke barriers
3. Water, moisture, or vapor barriers
4. Fire Protection Systems
5. Control Systems
6. Communication systems
7. Conveying systems
8. Noise and vibration control elements and systems

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

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would reduce the building's aesthetic qualities or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in visually unsatisfactory manner.

Retain the original installer or fabricator, if possible, to cut and patch the exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized experienced and specialized firm.

1. Stonework and stone masonry
2. Window wall systems
3. Ornamental metal
4. Firestopping
5. Stucco and ornamental plaster
6. Carpeting
7. Wall coverings

D. Approval: Obtain approval to proceed before temporary or permanent cutting and patching of the following categories:

1. Structural steel
2. Miscellaneous structural metals, including lintels, equipment supports, stair systems, and similar categories of Work
3. Structural concrete
4. Foundation construction
5. Steel

6. Lintels
7. Bearing and retaining walls
8. Structural decking
9. Exterior curtain wall construction
10. Equipment Supports
11. Piping, ductwork, vessels, and equipment
12. Structural systems of special construction
13. Shoring, bracing, and sheeting
14. Primary operational systems and equipment
15. Water/moisture/vapor/air/smoke barriers, membranes, and flashings
16. Noise and vibration control elements and systems
17. Control, communication, conveying, and electrical wiring systems

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

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

1.05 SUBMITTALS

Procedural Proposal for Cutting and Patching: Submit proposed procedures for this Work well in advance of the time Work shall be performed, and request approval to proceed. Include the following information, as applicable, in the submittal:

A. Describe nature of the Work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the Work in terms of changes to existing Work, including structural, operational, and visual changes as well as other significant elements.

B. List products to be used and firms, including their qualifications, that shall perform the Work.

C. Give dates when Work is expected to be performed.

D. List utilities that will be disturbed or otherwise affected by Work, including those that will be relocated and those that will be out of service temporarily. Indicate how long utility service shall be disrupted.

E. Acknowledge that the Architect’s approval to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory Work.

F. Submit details and engineering calculations to show how reinforcement is integrated with original structure to satisfy requirements when cutting and patching of structural Work involves the addition of reinforcement.

G. List certified welder who shall perform structural welding.

1.06 WARRANTY

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

PART 2 - PRODUCTS

2.01 MATERIALS

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

B. Trade Name: The use of a trade name and supplier's name and address shall indicate a possible source of the product. Products of the same type from other sources shall not be excluded provided they possess like physical and functional characteristics.

C. Identical Materials: Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials with installed performance equal to or surpassing that of existing materials.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. Trade Meeting: Before the start of cutting Work, meet at the Work site with the parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate layout of the Work and resolve potential conflicts before proceeding with the Work.

3.02 PREPARATION

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

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

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

D. Precautions: Take necessary precautions to protect existing pipe conduit, or ductwork serving the building, and schedule to remove or relocate conduits until bypass provisions have been made.

3.03 PERFORMANCE

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

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

C. Damage Control: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Review proposed procedures with the original installer, where possible; comply with the original installer's recommendations.

1. Use hand or small tools designed for sawing or grinding, where cutting is required. Do not hammer and chop. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Cut the exposed or finished side into concealed surfaces to avoid marring existing finish.

3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections or Division 2 where cutting and patching require excavating and backfilling.

5. Bypass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated, or abandoned. Cut off pipe or conduit in walls or partitions to be removed. Cap valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.

D. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that shall eliminate

evidence of patching and refinishing.

3. Patch, and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance when removal extends one finish area into another. Remove existing floor and wall coverings and replace with new materials, as necessary to achieve uniform color and appearance.

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

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

3.04 CLEANING

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

B. Traffic: Do not permit traffic over unprotected floor surface.

END OF SECTION

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 sanitary sewer collection 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 sanitary sewer 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 ± one meter. 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 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	At Substantial Completion
Electronic Data and revisions related to Existing Assets	As Encountered

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. Section 01510 – Sanitary Sewer Main Television & Inspection (CCTV)

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, sewer manholes with asset IDs and sewer 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 sanitary 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. 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 Attributes Template

ID	Northing	Easting	Depth	Size	Material

B. Asset IDs for manholes 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 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.

Sewer Mains Attributes Template

US_Manhole_ID	DS_Manhole_ID	US_MH_Depth	DS_MH_Depth	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. 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
DIP	Ductile Iron Pipe
CIP	Cast Iron Pipe
CMP	Corrugated Metal Pipe
Tile	Tile
Brick	Brick

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 execution 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) through (x) 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:

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

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

E. The **Contractor** shall complete the latest edition of 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.

1.03 LAND DISTURBANCE PERMIT

A. The **Contractor** shall pull final DeKalb County Land Disturbance Permit (LDP) that was obtained during the final design by the Engineer of Record.

END OF SECTION

SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

This section includes a list, but may not be inclusive of all applicable abbreviations for technical societies, organizations, and bodies relevant to the work. Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization, or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids whether listed below or not. Such standards are made a part hereof to the extent which is indicated or intended. Unless directed otherwise by the Owner's Representative, the most stringent shall apply.

1.02 DEFINITIONS AND ABBREVIATIONS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACOE	Army Corps of Engineers
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
AMCA	Air Moving and Conditioning Association
APA	American Plywood Association
APHA	American Public Health Association
API	American Petroleum Institute
APWA	American Public Works Association

ARC	Appalachian Regional Commission
AREA	American Railway Engineering Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials International
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CCTV	Closed Circuit Television
CERP	Sanitary Sewer Overflow Contingency and Emergency Response Plan
CFR	Code of Federal Regulations
CIPP	Cured-In Place Pipe
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
CTI	Cooling Tower Institute
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
DEMA	Diesel Engine Manufacturers Association
DTCS	Document Tracking Control System
EDA	Economic Development Administration
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FHA	Farmers Home Administration
FRA	Federal Railroad Association
FS	Federal Specifications
GA-DOA	Georgia Department of Agriculture
GDOT	Georgia DOT
GIS	Geographic Information System

GSWCC	Georgia Soil and Water Conservation Commission
HEI	Heat Exchange Institute
ICRI	International Concrete Repair Institute
IEEE	Institute of Electronic and Electrical Engineers
IES	Illuminating Engineering Society
I/I	Infiltration and Inflow
IPBA	International Pipe Bursting Association
IPCEA	Insulated Power Cable Engineers Association
IPC	Institute of Printed Circuits
ISA	Instrument Society of America
JSA	Job Safety Analysis
LACP	Lateral Assessment & Certification Program
MACP	Manhole Assessment and Certification Program
MARTA	Metropolitan Atlanta Rapid Transit Authority
MBMA	Metal Building Manufacturers Association
MMA	Monorail Manufacturers Association
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry
MUTCD	Manual for Uniform Traffic Control Devices
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRMA	National Ready-Mix Association
NWP	Army Corps of Engineers Nationwide Permit
OSARP	Ongoing Sewer Assessment and Rehabilitation Program
OSHA	Occupational Safety and Health Administration
PACP	Pipeline Assessment Certification Program
PCA	Portland Cement Association
PCI	Pre-stressed Concrete Institute

PCN	Army Corps of Engineers Preconstruction Notification
PPE	Personal Protective Equipment
PPI	Plastic Pipe Institute
PSARP	Priority Areas Sewer Assessment and Rehabilitation Program
PVC	Polyvinyl Chloride Pipe
RCRA	Resource Conservation and Recovery Act
SBC	Southern Building Code
SDS	Safety Data Sheet
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
TEMA	Tubular Exchangers Manufacturers Association
UBC	Uniform Building Code
UL	Underwriters Laboratories
USDC	United States Department of Commerce
USEPA	United States Environmental Protection Agency
WCTS	Wastewater Collection and Transmission System
WPCF	Water Pollution Control Federation

1.03 SYMBOLS

Symbol and material legends shall be as scheduled on the Contract Drawings.

END OF SECTION

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 CONNECTIONS TO EXISTING SYSTEM

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.

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 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 main office for recording water used for cleaning and other Work items requiring water.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

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 monthly 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 weekly progress meetings, the **Contractor** shall submit a Look-Ahead Schedule. This schedule shall cover four weeks: the immediate past week, the current week, and the forthcoming two weeks. This schedule shall include activities that are complete, started, incomplete or underway, or scheduled to be performed during this four-

week timeframe. Results of the Progress meetings shall be reported in the Project Progress Meetings.

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

SECTION 01210

MEASUREMENT AND PAYMENT

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. Methods of measurement and payment for items of work covered under the Bid Schedule

1.02 SUMMARY

A. The total bid price (inclusive of all base bid items and allowances) shall cover all work required by the Contract Documents. All work shall meet the latest DeKalb County Department of Watershed Management Design Standards Manual. All costs in connection with the proper and successful completion of the Work, including all materials, equipment, supplies, and appurtenances; providing all equipment and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid.

B. **All Work not specifically set forth as a pay item in the Bid Form shall be considered subsidiary obligations of Contractor and all costs in connection therewith shall be included in the prices bid.**

C. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only:

1. As a basis for estimating the probable cost of the Work.

2. For comparing the bids submitted for the Work.

D. The basis of payment for work shall be in accordance with the unit price bid items in the Bid Schedule and shall be full compensation for all labor, materials, and equipment required to furnish, install, construct, and test the Work covered under the unit price bid item. Payment for work will be made on a linear foot, vertical foot, square foot, square yard, cubic yard, or each based on the Contractor's measurement, contingent on verification by Owner's Representative. Contractor agrees he will make no claim for additional time, damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished.

E. Payment will be made only for the actual quantities of work performed in compliance with the Drawings and Specifications. The Contractor will be paid an amount equal to the approved quantity times the applicable unit price. Any unused balance of the unit price work shall revert to the Owner upon completion of the project.

F. Pay requests for work performed shall be itemized by asset. The pay request should list each asset by ID number, describe the work performed per the payment bid form, provide the unit cost, and provide the extended cost. When seeking partial payment where work was attempted and could not be completed, Owner approved information shall be provided on the pay request to justify the amount requested. Work performed on pipes should be listed in a separate table from work performed on manholes. The Owner's Representative will provide an example of the table format.

Additional instructions and/or requirements may be provided by the Owner's Representative at the project Kick-off meeting.

1.03 MEASUREMENT OF QUANTITIES

A. Final payment quantities shall be determined from the record drawings. The record drawing lengths, dimensions, quantities, etc. shall be determined by a survey after completion of all required work. The precision of final payment quantities shall match the precision shown for that item in the Bid Schedule. Measurements will be taken according to the United States standard measurements and in the manner as specified in these Specifications.

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

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

C. Payment for Base Bid will be based on periodic Work placed and materials stored onsite for that same respective period. Payment will be measured periodically by assessing the percent complete for each scheduled item in the Schedule of Values. For each scheduled work item, the line shall include the cost of all labor, materials, equipment, tools, supervision, scheduling, safety program, coordination, engineering, testing, surveys, layout, cleanup, and other things and services required to complete the entire Project in strict conformity with the Contract.

D. Mobilization, Demobilization and Closeout: There will be no separate charge for mobilization,

demobilization, and closeout by the Contractor. Contractor must include any costs associated with mobilization, demobilization, and closeout in this Contract.

E. Allowances: See Section 01020. This Contract includes One (1) Owner Directed Work Allowance that will be used at the discretion of the County for any of the purposes designated below and for unforeseen conditions and additional work items associated with the original scope of work.

F. Traffic Control: There will be no separate charge for Traffic Control by the Contractor. Contractor must include any costs associated with Traffic Control in the Base Bid in this Contract.

G. GPS Data Collection: There will be no separate charge for GPS Data Collection by the Contractor. Contractor must include any costs associated with GPS Data Collection in the Base Bid in this Contract.

H. Sewer Flow Control: There will be no separate charge for Sewer Flow Control (including by-pass pumping) by the Contractor. Contractor must include any costs associated with Sewer Flow Control in the Base Bid in this Contract.

1.04 UNIT PRICE BID ITEMS

1. ABANDON EXISTING GRAVITY MAINS AND MANHOLES

A. Measurement for payment will be Lump Sum per the bid form. Payment will constitute full compensation for existing gravity main and associated manholes abandonment per Department of Watershed Management (DWM) Standard for Abandonment of Pipelines and Standard Detail No. S-005, Method of Manhole Abandonment. Measurement shall be based on the amount of FLOWABLE FILL installed per linear foot of pipeline as directed by the Owner's Representative. The unit price bid shall include, but not be limited to, all costs for material, labor, equipment, and other miscellaneous items as required for a complete abandonment.

2. PACKAGE PUMP STATION

A. Measurement for payment shall be on a Lump Sum basis. Payment will constitute full compensation for all costs for the installation of the submersible pumps and associated guide rail systems; connection of all floats / transducers / other level monitoring equipment and instrumentation and controls as specified in Section 11303; setup and testing of all components; package vent and odor control system; coordination with factory and manufacturer's representatives; start-up testing support; delivery of factory provided operations and maintenance manuals and logs, spare parts and assemblies, and nameplate and serial number data; pressure testing; and all other work incidental to making the pump station ready for service.

3. WET WELL AND APPURTENANCES

A. Measurement for payment shall be on a Lump Sum basis. Payment will constitute full compensation for all costs for the installation of the 10' wet well and associated divider wall; cast-in-place concrete base; epoxy coatings for the interior and exterior of the wet well; excavation, shoring, dewatering, and bedding for the wet well.

4. VALVE AND METER VAULT

A. Measurement for payment shall be on a Lump Sum basis. Payment will constitute full compensation for all costs for the installation of the valve vault; entry hatches; all valves required, including plug valves, check valves, air release valves, and gate valve with stem riser and valve box; all bends, tees, and wyes required to install piping; link seals for wall penetrations; all bolt and gasket sets required; emergency float switch; ductile iron vent with bird screen; concrete encasement for piping; painting for all exposed ductile iron piping.

5. GRAVITY SEWER SYSTEM

A. Measurement for payment of furnishing and installing Ductile Iron Pipe and associated manholes intended for Gravity Sewer, Push-On Joint, by (size) diameter, shall be on a Lump Sum basis. Payment shall constitute full compensation for work necessary for installation of ductile iron pipe, including but not limited to furnishing, transporting, storing, and installing the pipe and associated fittings; ground penetrating radar pipe location along the pipeline route; saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements, and excavated material; excavation support system, utility support system, dewatering, temporary water service, backfilling, and compaction; cleaning, treating, and testing; site restoration; excavation, shoring, dewatering, and bedding for manhole installation; 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.

6. PRESSURIZED SEWER SYSTEM

A. Measurement for payment of furnishing and installing Ductile Iron Pipe and associated manholes intended for Force Main, by (size) diameter, shall be on a Lump Sum basis. Payment shall constitute full compensation for work necessary for installation of ductile iron pipe, including but not limited to furnishing, transporting, storing, and installing the pipe and associated fittings; ground penetrating radar pipe location along the pipeline route; saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements, and excavated material; excavation support system, utility support system, dewatering, temporary water service, backfilling, and compaction; cleaning, treating, and testing; site restoration; thrust blocking; excavation, shoring, dewatering, and bedding for manhole installation; 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.

7. CIVIL SITE WORK

A. Measurement for payment of performing Civil Site Work shall be on a Lump Sum basis. Payment shall constitute full compensation for work including but not limited to grading, drainage, and fill, including compaction; easement clearing, tree removal; clearing for the access road; concrete paving for the access road and pump station pad, including all related preparatory work; installation of H-20 rated pervious pavers and all related preparatory work; construction exit; existing fence demolition; fence and gate installation,

including slats, gate motor and drivechain; installation of RCP stormdrain pipe and associated fittings, headwall, inlets, and stormwater retention feature; bollards; sidewalk restoration; installation of 57 stone along access road and around pump station pad, as specified in the Drawings; installation of any new trees and shrubbery to satisfy any tree recompense requirements; and other specified work.

8. JIB CRANE AND HOIST

A. Measurement for payment of furnishing and installing the specified jib crane and hoist, including all rigging for the purpose of lifting pumps, shall be on a Lump Sum basis.

9. ELECTRICAL CONTROLS AND SCADA

A. Measurement for payment for Electrical Controls and SCADA integration shall be on a Lump Sum basis.

B. Payment shall constitute full compensation for providing and installing new electrical service to the pump station; provision and installation of all electrical, controls, and SCADA elements and enclosures, including Remote Telemetry Unit (RTU); and shall include, but not be limited to, all required wire, cabling, conduit, NEMA enclosures, brackets, hangers, bulbs, light fixtures, stands, junction boxes, switches, testing, startup, training, and all other ancillary materials, parts, equipment, and labor.

10. GENERATOR

A. Measurement for payment for the Generator shall be on a Lump Sum basis. Payment shall constitute full compensation for providing and installing the standby power backup generator, automatic transfer switch, and all associated parts, equipment, and labor.

11. SITE WATER UTILITIES

A. Measurement for payment for furnishing and installing water service shall be on a Lump Sum basis, in accordance with the requirements of the Contract Documents.

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

12. SITE GAS UTILITIES

A. Measurement for payment for furnishing and installing gas service shall be on a Lump Sum basis, in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing gas services shall constitute full compensation for the complete installation and testing of the gas service from the gas meter to the generator on site. Gas services shall include excavation and backfill. 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, placement, backfilling and compaction; cleaning, treating, and testing; cleanup, site restoration; and other specified work.

13. EROSION CONTROL COMPLETE

A. Measurement for payment for Erosion Control Complete shall be Lump Sum. Payment shall be at 50% of the Lump Sum Bid Price upon installation and approval of installation by the County. The remaining 50% shall be paid in equal increments based on the anticipated number of remaining Progress Payments to Substantial Completion. Erosion and sedimentation control measures shall comply with the requirement of these Specifications; the Georgia Erosion and Sedimentation Act of 1975, as amended; the Manual for Erosion and Sediment Control of Georgia, latest edition; and local soil erosion and sedimentation control ordinances. No payment will be made for any portion of the Project when temporary erosion and sedimentation controls are not properly maintained.

1.05 ADDITIONAL UNIT PRICE ITEMS AS DIRECTED BY OWNER:

A. Unsuitable Soil Replacement (Crusher Run) - Measurement for payment will be per cubic yard (CY) compacted in place. All costs for hauling off the unsuitable material, hauling and placing imported fill material shall be included in the unit price. Payment will be made on the basis of cubic yards (CY) compacted in place. No soil backfill shall be used in pipe trenches under roadways or other paved areas. In all paved areas, trenches shall be backfilled with crushed rock and compacted in lifts to a minimum required compaction of ninety-five percent (95%) of the maximum dry density. This pay item includes from the top of pipe bedding zone to the bottom of the concrete cap. Refer to the latest DeKalb County Department of Watershed Management Design Standards Manual Standard Detail No. G-005. Separate payment will be made for surface restoration. Payment for materials testing shall be made separately.

B. Stabilization Matting - Measurement for payment will be per square yard (SY). Payment will constitute full compensation for fine grading, fertilizing, and matting of disturbed sloped areas.

C. Seeding - Measurement for payment will be per square yard (SY). Payment will constitute full compensation for fine grading, fertilizing, and sodding disturbed landscaped areas on public or private property in accordance with Section 02485. Grass seeding shall match in kind the existing adjacent grass of previously landscaped areas. Soil preparation and/or topsoil shall be included.

D. Silt Fence - Measurement for payment will be per linear foot (LF) for Type C silt fence suitably installed and maintained per single row as required by the Manual for Erosion and Sediment control of Georgia, latest edition. Payment will constitute full compensation for all costs associated with silt fence, including installation, maintenance, repair, removal and disposal.

E. Check Dams - Measurement for payment will be per each (EA) for check dams suitably installed and maintained per the Manual for Erosion and Sediment Control of Georgia, latest edition and paid through the respective Contingency Allowance. Payment will constitute full compensation for all costs associated with check dams, including grading, installation, maintenance, repair, removal, and disposal.

F. CCTV Inspection - Measurement for payment will be per linear foot (LF) from center of manhole to center of manhole through the respective Contingency Allowance. Payment will constitute full compensation to perform a CCTV sewer pipe inspection on sanitary sewer mains when called for by the County. No payment will be made when the Contractor needs to or is required to provide CCTV inspection to supplement a rehab or replacement work item. Defect coding, header data, and coding of service lateral locations are required and shall meet the Technical Specifications format and submittal requirements. There will be no separate payment made for light cleaning, use of an easement machine, or data delivery. Payment shall only be made for the footage of sewer inspection between the manholes. Maintenance of traffic and associated traffic control measures required for the Work shall be included in the unit price. Costs shall include, but are not limited to, labor, equipment, transportation, setup, tools, bypass pumping, public notification, data management and all other related procedures and materials necessary to complete the inspections, in accordance with Section 01510.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

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

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

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

D. Specific submittals are described in individual sections.

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

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

G. Submittals shall be submitted to the **County** using the **County's** Document Tracking and Control System (DTCS) as outlined in **Section 01350 – Project Document Tracking and Control System**. 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.

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. Submittals shall be uploaded to the **County's** DTCS in PDF format unless otherwise specified by the **County**.

B. If the County requests a submittal in hard copy, then the following formats apply:

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

2. Small sheets or pages:
   a. Minimum sheet size: 8-1/2 by 11 inches
   b. Maximum sheet size for opaque copies: 11 by 17 inches
   c. Number of copies shall be the same as for larger sheets

3. Samples:
   a. Two sets of each shall be submitted with the original submittal.
   b. One set shall be returned.
   c. 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 adequate 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. Allow 30 calendar days for County and Engineer Review of all submittals.

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**.
   6. NOT REVIEWED/RECORD COPY: Indicates that the submittal was required but design and/or approval was by other(s) based on the specifications.

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

A. Submittals shall be returned to the **Contractor** through the DTCS.

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 and file in the DTCS.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

Section includes progress documentation requirements.

1.02 SUBMITTALS

The Initial Baseline Schedule shall be submitted to the **County** within 15 calendar days after NTP. The final baseline schedule is to be submitted to the **County** within 15 calendar days after receiving comments from the **County** on the Initial Baseline Schedule. After receiving acceptance of the Baseline Schedule, the **Contractor** shall submit Progress Schedule Updates along with the Monthly Application for Payment.

1.03 FORM OF SUBMITTALS

A. Schedules - General:
   1. Provide legend of symbols and abbreviations for each schedule.
   2. Use the same terminology as that used in the contract documents.

B. Format - Bar Chart:
   1. Provide individual horizontal bars representing the duration of each major activity.
   2. Coordinate each element on the schedule with other construction activities.
   3. Show activities in proper sequence, including submittals, equipment delivery, materials delivery, installation, Progress Meetings, Progress Payments, testing, and any other level of effort activity such as General Conditions.
   4. Include the budgeted total cost, actual total cost, remaining total cost, and at completion total cost.
   5. Use vertical lines to mark the time scale at not more than 1-week intervals.
   6. Use sheets of sufficient number and width to show the full schedule clearly.
   7. Use Critical Path Methodology, resource/cost loading while developing the schedule. Tasks on the critical path shall be indicated in RED.
   8. Prior to creating the baseline schedule the **Contractor** shall coordinate with the **County's** representative to identify the required Work Breakdown Structure, Resource Dictionary, and Activity Codes to be utilized on said schedule.

C. Copies: Submit a minimum of two copies.

PART 2 – PRODUCTS

2.01 SOFTWARE / PROGRAMS

Schedules shall be prepared in Primavera P6 or, with **County** approval, Microsoft Project.

PART 3 - EXECUTION

3.01 PROGRESS SCHEDULE

A. Prepare and submit Progress Schedule.

B. Provide Progress Schedule in the form of bar charts.

C. The **County** will promptly review the schedule and notify the **Contractor** of acceptability. If schedule is not satisfactory, the **Contractor** shall revise and resubmit within 3 days.

D. Make and distribute copies of accepted schedule to the **County**, to subcontractors, and to other entities whose Work will be influenced by schedule dates.

E. Update the schedule whenever changes occur or are made, or when new information is received, but not less often than at the same intervals at which applications for payment are made. Payments may be withheld if schedule updates are not submitted as required.

F. The initial schedule and update information shall be provided by the **Contractor**. This information is a representation of the best efforts of the **Contractor** and its subcontractors as to how they envision the Work to be accomplished. Similarly, progress information to be provided by and through the **Contractor** shall be an accurate representation of its or its subcontractors' or suppliers' actual performance. The schedule shall remain an accurate reflection of the **Contractor's** actual or projected sequencing of Work. Once accepted, adherence to the established schedule shall be obligatory upon the **Contractor** and its subcontractors for the Work under this Contract. The **County** may require the **Contractor** to revise the schedule if, in its judgment, the schedule does not accurately reflect the actual execution of the Work or is in violation of any provision on this scheduling specification. The **Contractor** shall revise the schedule as often as is required or necessary during the course of performance of the Work without additional cost to the **County**.

G. On a weekly basis, the **Contractor** shall submit a Two-Week Look-Ahead schedule. This schedule will filter out work completed one week prior to the current data date, and two weeks after the current data date; and submitted to the **County** in both PDF and XER format.

3.02 PROGRESS OF WORK

A. The Work shall be started on the date indicated in the Notice to Proceed coinciding with the accepted baseline schedule and shall be executed with such progress as may be required to prevent delay to other contractors or to

the general completion of the project. The Work shall be executed at such times and in or on such parts of the project, and with such forces, material, and equipment, as to assure completion of the Work in the time established by the Contract. Additionally, the **Contractor** shall schedule and direct Work so to provide an orderly progression of the Work to completion within the specified Contract Time.

B. The **Contractor** agrees that whenever it becomes apparent from the current accepted monthly schedule update, that delays to the project have resulted and these delays are through no fault of the **County,** and hence, that the Contract completion date will not be met, or when so directed by the **County,** the **Contractor** shall take some or all of the following actions at no additional cost to the **County.**

1. Increase Work force in such quantities and crafts as shall substantially eliminate the backlog of Work.
2. Increase the number of working hours per shift; shifts per working day, or days per week; the amount of construction equipment, etc., or any combination of the foregoing to substantially eliminate the backlog of Work. County to be compensated by Contractor for additional costs required to support increased hours and weekend work. Costs include but not limited to additional Construction Management and Construction Inspection.
3. Schedule activities to achieve maximum practical concurrence of accomplishment of activities and comply with the revised schedule.
4. The **Contractor** shall submit for reviewing a written statement of the steps it intends to take, to remove, or arrest the delay to the schedule. If the **Contractor** fails to submit a written statement of the steps it intends to take or fails to take such steps as required by the Contract, the **County** may direct the level of effort in workforce (trades), equipment, and Work schedule (overtime) to remove or arrest the delay to the project in the accepted schedule, and the **Contractor** shall promptly provide such level of effort at no additional cost to the **County**. In addition, should schedule delays persist; the **Contractor's** bond agent shall be asked to attend meetings to update the schedule.

C. Failure of the **Contractor** to comply with the requirements of this provision shall subject it to, at the **County's** sole discretion, withholding, in partial or in total, payments otherwise due the **Contractor** for Work performed under this Contract. The **Contractor** agrees that any withholding of moneys is not a penalty for noncompliance, but is an assurance for the **County** that funds shall be available to implement these requirements should the **Contractor** fail to do so, since failure of the **Contractor** to comply with these requirements shall mean that the **Contractor** failed to execute the Work with such diligence as to ensure its completion within the time for completion.

END OF SECTION

SECTION 01350

PROJECT DOCUMENT TRACKING AND CONTROL SYSTEMS

PART 1 - GENERAL

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 24 x 36 documents, double-sided, onsite for the entire duration of the Project. Documents shall be scanned in and attached to the appropriate Contract Manager 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. Company Directory: Addresses, Phone Numbers, Personnel Contacts, etc.
2. Drawings Log: Current Drawing revision log
3. Submittals Integrated with Project Schedule through Activity codes
4. Transmittals
5. Risk Register
6. Requests for Information (RFIs)
7. Requests for Proposal (RFPs)

8. Work Authorization Requests (WARs)
9. Work Authorizations (WAs)
10. Change Order Requests (CORs)
11. Change Orders (COs)
12. Daily Reports (Daily Diaries)
13. Field Decisions, Field Orders (FOs), and Clarification Memos
14. Notice of Non-Compliance
15. Construction issue memos
16. Punch lists
17. Meeting Minutes and agendas
18. Correspondence
19. Work Plans
20. Startup Plans
21. Equipment Operations & Maintenance training
22. 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, along with the **Contractor**'s management team, shall work closely with 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 meet with the **County** within 15 days after the Contract is awarded to discuss access requirements and the **Contractor's** plan to utilize DTCS and execute the document control functions herein.

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

1.02 COMPANY DIRECTORY

The **Contractor** and the **County** shall monitor and manage the Company Directory. The directory shall include Company name, Company abbreviation, contact names, address, phone

numbers, and e-mail addresses.

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, WARs, WAs, RFIs, Field Orders, 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

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

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

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

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

E. Work Plans, Startup Plans, O&M Submittals, and Spare Parts: Testing, Startup, and O&M submittals shall be entered into the DTCS by the Contractor. These submittals shall be identified as individual submittals within the submittal packages identified with numbering as specified above.

F. Submittal Procedures: The Contractor shall prepare submittal packages utilizing the submittal numbering system, description, and packaging conventions described above. Submittals prepared by the Contractor that fail to follow the conventions described above, will be returned "amend and resubmit." Should the Contractor determine that a submittal is required and is

not covered by the listing within the DTCS, the Contractor shall consult with the County to determine the submittal number, description, and packaging that shall be required.

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**.

1.06 TRANSMITTAL LOG

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

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 REQUESTS 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), Work Authorization Requests (WARs), Work Authorizations (WAs), Change Orders Requests (CORs), and Change Orders (COs). Change documents will be monitored and managed by the **County** utilizing the DTCS. The DTCS shall track “Ball in Court” status of change documents.

1.10 DAILY REPORTS

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

1.11 PUNCH LISTS

The **County** will monitor and manage punch lists and will create punch lists to be forwarded to the **Contractor**. The **Contractor** shall address the punch list items that have been assigned to the **Contractor** and forward updates to the **County**. Once accepted as complete, the **County** will access the punch list in the DTCS and close it out.

1.12 MEETING MINUTES AND AGENDA

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

1.13 PROGRESS PAYMENTS /REQUISITIONS FOR PAYMENT

The **Contractor** is responsible for creating progress payment applications directly from the project scheduling software and then forwarding them to the **County** electronically, along with hard copies, by 4:00 p.m. at the end of each update/billing period. The **Contractor** shall also simultaneously provide a separate submittal of the updated progress schedule (P6 or latest version at the time of purchase), as specified in **Section 01310 - Construction Schedule**, Schedule of values shall be developed as defined in **Section 01310 - Construction Schedule** within the Pay Application and shall be coordinated with the **County**’s Project Manager. 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 - Construction Schedule** shall be just cause for withholding the monthly or final payment.

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 dive 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. One set of digital images shall be furnished on a DVD. 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 information below shall be printed on a sheet of paper in a clear sleeve to be included in the binder holding the 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. Binders shall be equipped with a pocket suitable for storing the photo 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’s** Project Document Tracking and Control System to submit videos and progress photographs in electronic format for the duration of the project in accordance with **Section 01350 - Project Document Tracking and Control Systems**.

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

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

Section 01410 - Testing Laboratory Services.

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.

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.

PRODUCTS (Not Used)

SECTION 2 - EXECUTION

2.01 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

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. 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.

F. Fresh concrete sampling and testing at the Site and soil compaction testing at the Site will be provided through the Special Inspections and Testing Allowance.

1.02 LABORATORY DUTIES

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

B. Provide qualified personnel promptly on notice.

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

1. Comply with specified standards, ASTM, other recognized authorities and as specified.
2. Ascertain compliance with requirements of Contract Documents.

D. Promptly notify 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.

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 01450
SPECIAL INSPECTIONS, TESTING, AND OBSERVATIONS

PART 1 - GENERAL

1.01 SCOPE

A. This section covers requirements for Special Inspection and Testing and Observations required in accordance with Chapter 17 of the 2018 IBC and is in addition to and supplements requirements included in Statement of Special Inspections provided in Supplement located at end of this section. Special Inspections and Testing hereafter will be referred to as Special Inspections. Observations will be referred to separately.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
2. International Code Council (ICC):
   a. International Building Code (IBC).
   b. Evaluation Service (ICC-ES) Reports and Legacy Reports.

1.03 DEFINITIONS

A. Agencies and Personnel:

1. Agency Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be **County** when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.
2. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.
3. Registered Design Professional in Responsible Charge: An individual who is registered or licensed to practice their respective design profession as defined by statutory requirements of professional registration laws of state or jurisdiction in which Project is to be constructed.
4. Special Inspector: Qualified person selected by **County** (or agent of **County**) and engaged by **Contractor** under Special Inspections and Testing Allowance, who will demonstrate competence to the

satisfaction of AHJ for inspection of a particular type of construction or operation requiring Special Inspection.

B. Statement of Special Inspections: Detailed written procedure establishing systems and components subject to Special Inspection, Observation, and Testing during construction, type and frequency of testing, extent and duration of Special Inspection, and reports to be completed and distributed by Special Inspector.

C. Special Inspection:

1. Special Inspection: Inspection required of materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved Contract Documents and referenced standards.
2. Special Inspection, Continuous: Full-time observation of work requiring Special Inspection by an approved Special Inspector who is present in area where the Work is being performed.
3. Special Inspection, Periodic: Part-time or intermittent observation of the Work requiring Special Inspection by an approved Special Inspector who is present in area where the Work has been or is being performed, and at completion of the Work.

D. Structural Systems and Components:

1. Diaphragm: Component of structural lateral load resisting system consisting of roof, floor, or other membrane or bracing system acting to transfer lateral forces to vertical resisting elements of structure.
2. Drag Strut or Collector: Component of structural lateral load resisting system consisting of diaphragm or shear wall element that collects and transfers diaphragm shear forces to vertical force-resisting elements or distributes forces within diaphragm or shear wall.
3. Seismic-Force-Resisting System: That part of structural lateral load resisting system that has been considered in the design to provide required resistance to seismic forces identified on Drawings.
4. Shear Wall: Component of structural lateral load resisting system consisting of a wall designed to resist lateral forces parallel to plane of the wall. Unless otherwise noted on Drawings, load-bearing walls with direct in-plane connections to roof and floors shall be considered to be shear walls.
5. Wind-Force-Resisting System: That part of the structural system that has been considered in the design to provide required resistance to wind forces identified on Drawings.

E. Nonstructural Components:

1. Architectural Component Supports: Structural members or assemblies of members which transmit loads and forces from architectural systems or components to structure, including braces, frames, struts, and attachments.
2. Electrical Component Supports: Structural members or assemblies which transmit loads and forces from electrical equipment to structure, including braces, frames, legs, pedestals, and tethers, as well as elements forged or cast as part of component for anchorage.
3. Mechanical Component Supports: Structural members or assemblies which transmit loads and forces from mechanical equipment to structure, including braces, frames, skirts, legs, saddles, pedestals, snubbers, and tethers, as well as elements forged or cast as part of component for anchorage.

F. Professional Observation:

1. Does not include or waive responsibility for required Special Inspection or inspections by building official.
2. Requirements are indicated on Statement of Special Inspections.
3. Geotechnical Observation: Visual observation of selected subgrade bearing surfaces and installation of deep foundation elements by a registered design professional for general conformance to Contract Documents.
4. Structural Observation: Visual observation of structural system(s) by a registered design professional for general conformance to Contract Documents.

1.04 SUBMITTALS

A. Informational Submittals:

1. Fabricator's Certificate of Compliance: Form shall be completed by entity responsible for shop fabrication of structural load-bearing members and assemblies. Refer to Article Supplements located at end of section.
2. Special Inspections pre-construction meeting minutes.

1.05 STATEMENT OF SPECIAL INSPECTIONS REQUIREMENTS

A. Designated Systems for Inspection:

1. Seismic-force-resisting systems designated under IBC Section 1705 and subject to Special Inspection under Section 1705: None required.
2. Wind-force-resisting systems designated under IBC Section 1705: None required.
3. Architectural, Mechanical, and Electrical Components subject to Special

Inspection under IBC Section [1705.12.5 through 1705.12.9] for Seismic Resistance: As listed in Statement of Special Inspections.

B. Statement of Special Inspections:

1. As included in Supplement located at end of this section and in support of building permit application, Project-specific requirements were prepared by Registered Design Professional in Responsible Charge. The following identifies elements of inspection, observation, and testing program to be followed in construction of the Work.
   a. Designated seismic systems and components that are subject to Special Inspection for lateral load resistance.
   b. Special Inspection and testing required by IBC Section 1705 and other applicable sections and referenced standards therein.
   c. Type and frequency of Special Inspection required.
   d. Type and frequency of testing required.
   e. Required frequency and distribution of testing and Special Inspection reports to be distributed by Special Inspector to **Engineer**, **Contractor**, building official, and **County**.
   f. Geotechnical Observation to be Performed: Required frequency and distribution of Geotechnical Observation reports by registered design professional to **Contractor**, building official, and **County**.
   g. Structural Observations to be Performed: Not required for this Project.

C. Special Inspection and associated testing of shop fabrication and field construction will be performed by an approved accredited independent agency or by Agency Having Jurisdiction's (AHJ) approved, qualified inspection staff. **County** (or agent of **County**) will select agency to perform Special Inspection and associated testing. **Contractor** shall secure and pay for services of agency through the Special Inspections Allowance to perform Special Inspection and associated testing.

D. Code required Special Inspection with associated testing and Professional Observation, as provided in Statement of Special Inspections and further provided in this section, is for benefit of **County** and does not:

1. Relieve **Contractor** of responsibility for providing adequate quality control measures.
2. Relieve **Contractor** of responsibility for damage to or loss of material before acceptance.
3. Constitute or imply acceptance.
4. Affect continuing rights of **County** after acceptance of completed Work.

E. The presence or absence of code required Special Inspector and Professional

Observer does not relieve **Contractor** from Contract requirements.

F. **Contractor** is responsible for additional costs associated with Special Inspection, Observation and Testing when Work is not ready at time identified by Contractor and Special Inspectors and Professional Observer are onsite, but not able to provide contracted services.

G. **Contractor** is responsible for associated costs for additional Special Inspection and Testing and Professional Observation by Special Inspectors and Professional Observers required because of rejection of materials of in place Work that cannot be made compliant to Contract Document without additional inspections, observation and testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. Requirements of the Statement of Special Inspections are provided by the **County**. All other testing and inspections, unless noted otherwise, are provided by **Contractor**.

B. Prepare Special Inspections pre-construction meeting agenda and organize meeting. Notify attendees at least 14 days in advance. Provide meeting room.

1. Provide access to shop or Site for Special Inspection and Testing and Professional Observation requirements.

C. Notify **Engineer** in advance of required Special Inspection and Professional Observation no later than 72 hours prior to date of Special Inspection and Professional Observation.

D. Provide access for Special Inspector to construction documents.

E. Retain special inspection records on-site to be readily available for review.

F. Cooperate with Special Inspector and provide safe access to the Work to be inspected.

G. Submit Fabricator's Certificates of Compliance for approved fabricators.

H. Provide reasonable auxiliary services as requested by the Special Inspector. Auxiliary services required include, but not limited to:

1. Providing access to the Work and furnishing incidental labor and

facilities necessary to facilitate inspections and tests to assist the Special Inspector in performing test/inspections.

2. Providing storage space for the Special Inspector's exclusive use, such as for storing and curing concrete test samples and delivery of samples to testing laboratories.
3. Providing the Special Inspector with access to all approved submittals.
4. Providing security and protection of samples and test equipment at the Project Site.
5. Provide samples of materials to be tested in required quantities.

I. When required by Registered Design Professional in Responsible Charge, provide access for mechanical and electrical component inspections for those items requiring certification.

J. Materials and systems shall be inspected during placement where Continuous Special Inspection is required.

K. Where Periodic Special Inspection is indicated in the Statement of Special Inspections:

1. Schedule inspections for either during or at completion of their placement or a combination or both.
2. Schedule periodically inspected Work (either inspected during or after its placement) so that corrections can be completed and re-inspected before Work is inaccessible.
3. Sampling a portion of the Work is not allowed. Schedules shall provide for inspection of all Work requiring periodic inspection.

3.02 SUPPLEMENTS

A. The supplements listed below, following "End of Section," are a part of this specification:

1. Fabricator's Certificate of Compliance.
2. Statement of Special Inspections.
3. Schedule of Special Inspection Services.

END OF SECTION

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.1 of the International Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: _____

Fabricator's Name: _____

Address: _____

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: **Kensington Road Pump Station & Pipeline Project**

LOCATION: **3350 Kensington Road, Decatur, Georgia 30032**

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

ARCHITECT OF RECORD: **Not Applicable**

STRUCTURAL ENGINEER OF RECORD: **David Preissler**

MECHANICAL ENGINEER OF RECORD: **George Ajy**

ELECTRICAL ENGINEER OF RECORD: **Alec Zaychik**

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: **David Preissler**

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2018 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Requirements for Wind Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

_X_ Weekly __Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

David A. Preissler
Type or print name

Signature 11/4/20
Date

Preparer's Seal

Building Official's Acceptance:

Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion Other; specify:_____

Statement of Special Inspections
Requirements for Wind Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Nominal Design Wind Speed, V_{asd}: 89 m.p.h.

Wind Exposure Category: C

Statement of Special Inspection for Wind Resistance Required (Yes/No): No
(Required in wind exposure Category B, where the nominal design wind speed, V_{asd}, is 120 miles per hour or greater. Required in wind exposure Category C or D, where the nominal design wind speed, V_{asd}, is 110 miles per hour or greater.)

Description of main windforce-resisting system subject to special inspection for wind resistance:
(Required for systems noted in IBC Section 1705.10.1 and 1705.10.2)

Description of windforce-resisting components subject to special inspection for wind resistance:
(Required for systems and components noted in IBC Section 1705.10.3)

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

Statement of Special Inspections
Requirements for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Seismic Design Category: C

Statement of Special Inspection for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Required for Seismic Design Categories C, D, E or F in accordance with IBC Sections 1705.12.1 through 1705.12.3 and 1705.13.1.)

Not Applicable

Description of designated seismic systems subject to special inspection and testing for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories C, D, E or F.)

Not Applicable

Description of nonstructural components subject to special inspection, testing and qualification for seismic resistance:
(Required for systems noted in IBC Section 1705.12.5 through 1705.12.9, 1705.13.2 and 1705.13.4 in Seismic Design Categories C, D, E or F.)

Anchorage of electrical equipment for emergency and standby power systems (generator set).

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

SCHEDULE OF SPECIAL INSPECTION SERVICES					
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT **	DATE COMPLETED
1704.2.5 Inspection of Fabricators					
Verify fabrication/quality control procedures.	In-plant review	Y	Periodic		
1705.1.1 Special Cases (Work unusual in nature, including but not limited to alternative materials and systems, unusual design applications, materials and systems with special manufacturer's requirements)	Submittal review, shop (3) and/or field inspection	Y	Periodic		
1705.3 Concrete Construction					
Inspection of reinforcing steel installation	Field inspection	Y	Periodic		
Inspection of cast-in-place anchor rods prior to and during placement of concrete	Field inspection	Y	Continuous		
Inspection of post-installed anchor rods to verify the hole drilling method is in accordance with manufacturer's printed installation instructions, hole location, hole diameter and depth, hole cleaning in accordance with manufacturer's printed installation instructions, anchor type, anchor diameter and length, anchor embedment, adhesive identification and expiration date, adhesive installation in accordance with manufacturer's printed installation instructions, edge distances(s), anchor spacing(s), concrete type, concrete compressive strength, age of concrete, concrete thickness and installation torque.	Field Inspection	Y	Continuous		
The special inspector must verify the initial installations of each type and size of anchor by construction personnel on site. Subsequent installations of the same type and size of anchor, by the same construction personnel is permitted to be performed in the absence of the special inspector. Any change in the anchor product being installed or the personnel performing the installation must require an initial inspection. For ongoing installations over an extended period of time, the special inspector must make regular inspections to confirm correct handling and installation the product.	Field Inspection	Y	Periodic		
Verification of required design mix	Review submittals	Y	Periodic		
Verify fresh concrete sampling	Field testing	Y	Continuous		
Verify fresh concrete slump, air content and concrete temperature at the time fresh concrete is sampled to make specimens for strength tests	Field testing	Y	Continuous		
Inspection of concrete and shotcrete placement for proper application techniques	Field review	Y	Continuous		
Concrete curing operations	Field review	Y	Periodic		
Erection of precast concrete members	Field review	Y	Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT **	DATE COMPLETED
Evaluation of concrete strength	Field testing and review of laboratory reports	Y	Periodic		
Inspection of formwork for shape, lines, location and dimensions	Field inspection	Y	Periodic		
1704.7 Soils					
Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection	Y	Periodic		
Verify excavations are extended to proper depth and have reached proper material.	Field inspection	Y	Periodic		
Perform classification and testing of controlled fill materials	Field inspection	Y	Periodic		
Verify site preparation complies with approved soils report.	Field inspection	Y	Continuous		
Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill	Field inspection	Y	Continuous		
Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection	Y	Continuous		
Verify dry-density of compacted fill complies with approved soils report	Review field testing	Y	Continuous		
1705.12.5 Architectural Components Special Inspections for Seismic Resistance					
Inspection during the erection and fastening of exterior cladding (canopy)	Field inspection	Y	Periodic		
1705.12.6 Plumbing, Mechanical and Electrical Components Special Inspections for Seismic Resistance					
Inspection during the anchorage of electrical equipment for emergency or standby power systems	Field inspection	Y	Periodic		
1705.13.2 Seismic Certification of Nonstructural Components					
Review certificate of compliance for nonstructural components	Certificate of compliance review	Y	Each submittal		

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SCOPE

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

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

C. The ownership of the trailers for **County**'s facilities shall remain with the **Contractor**. The office furnishings and equipment provided by **Contractor** under this section of specifications shall remain as **Contractor** properties.

1.02 REQUIREMENTS

A. General

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

2. Make provisions, and pay the costs of furnishing, installation, maintenance, professional services, permit fees, and site Work for the temporary facilities.

B. Construction

1. Temporary buildings shall be structurally sound, weather tight, with floors raised above ground. The mobile/modular buildings shall comply with GA-DCA/SBCC/ADA requirements.

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

1.03 CONTRACTOR'S FACILITIES

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

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

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

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

1.01 PREPARATION

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

1.02 INSTALLATION

A. Construct temporary field offices, first aid stations, and storage facilities on proper foundations and provide connections for utility services. Locate construction office facilities at locations within the Project approved by the **County**.

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

C. Provide an outside standpipe equipped with a non-freeze hose bib at **County's** Project Office. The hose bib shall be sized for a standard half-inch garden hose connection.

1.03 MAINTENANCE AND CLEANING

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

mopping and monthly waxing of the vinyl. **Contractor** shall also provide for monthly exterminating services of the offices.

1.04 REMOVAL

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

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

END OF SECTION

SECTION 01510

SANITARY SEWER MAIN TELEVISION AND INSPECTION (CCTV)

PART 1 — GENERAL

1.01 SECTION INCLUDES

This section includes guidelines and requirements for CCTV Inspection. CCTV inspection will be used to verify installed assessment, cleaning, rehabilitation, and/or replacement work as required.

1.02 REFERENCES

A. Codes, Specifications, and Standards - NASSCO – National Association of Sewer Service Companies – Pipeline Assessment Certification Program (PACP) Reference Manual, Version 7.0, or latest version.

B. Manual for Uniform Traffic Control Devices (MUTCD) standards

C. Attachment A – PACP Standard Exchange Database Anticipated Inspection Header Form Attribute Guidance Table (CCTV) (Reference NASSCO PACP Reference Manual, Version 7.0 for related information.

1.03 DEFINITIONS

A. Television Inspection: Operation necessary to complete a true-color audio-visual inspection verifying existing internal pipe conditions including pipe materials, pipe grade, connections, cracks, leaking joints, seepage and roots. **Contractor** shall furnish all labor, materials, equipment, tools, and other incidental services for CCTV.

B. MPEG: MPEG (pronounced M-peg), which stands for Moving Pictures Experts Group, is the nickname given to a family of International Standards used for coding audio- visual information in a digital compressed format. For the purposes of this specification, MPEG shall be defined as an ISO-MPEG Level 4 standard (MPEG- 4) digital audio-visual coding having a minimum resolution of 500 lines. All video files shall be named using .mpg or .wmv as the file extension.

C. External Hard Drive: For the purposes of this specification, an external hard drive is a peripheral auxiliary device connected to the computer via a high-speed interface cable. The interface cable allows the external hard drive to communicate with the computer so the data may be passed back and forth. The **Contractor** will deliver all inspection standard exchange databases, digital reports and media to the **County** on an external hard drive compatible

with the **County's** equipment and software and will provide adequate storage to contain all deliverables as outlined in the Specifications.

D. Buried Manhole: A manhole where the manhole cover (lid) is not visible at ground surface. Buried manholes usually require removing the material (excluding light dirt and plant material) covering the manhole lid and raising the manhole frame and cover (lid). All buried manholes on the sanitary systems shall be reported for rising following their location discovery by the **Contractor**.

1.04 SUBMITTALS

A. Submittals are to be in color PDF format for printed documents as well as other required formats when applicable for digital transfers.

B. Submit one example video on external hard drive of previous sewer inspection work that shows operational and structural defects in sewers, complete with audio commentary and inspection log(s).

1. Videos and inspection logs will be reviewed by the **County** to determine if quality of CCTV image is acceptable, if defects were properly identified, picture clarity, advancement speeds and lighting are acceptable and documented according to industry standards and the **County's** requirements.

2. Modify equipment and/or inspection procedures to achieve report material of acceptable quality.

3. Do not commence Work prior to approval of report material quality by the **County**. Upon acceptance, report material shall serve as standard for remaining Work.

C.

1.05 EXPERIENCE

A. Supervisor of the field crews performing these functions shall have the proper training and up- to-date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of five (5) years' experience in performing such assignments including safe work practices, etc.

B. Field crew leaders performing these functions shall have the proper training and up to date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of two (2) years' experience in performing such assignments including safe working practices, etc.

C. The **Contractor** shall provide the **County** with written documentation (certification) indicating the supervisor, field crew leader and all crewmembers responsible for these assignments have the proper training and the requisite experience.

D. No crew members shall enter confined spaces without the necessary certified training and permit.

E. The required experience shall be documented by the **Contractor. County** reserves the right to request and check the certification after the project being awarded.

F. A PACP certified technician or supervisor shall control operation of television equipment and encoding of inspection. Should **Contractor** utilize any personnel to actually document the inspection results not PACP certified, those inspections shall be refused, and re-survey shall be completely at the **Contractor's** sole expense.

1.06 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

A. All backups, overflows, spills and all associated damage is the **Contractor's** responsibility.

PART 2 - PRODUCTS

2.01 CCTV PERFORMANCE

A. The **Contractor** shall furnish the following, but not limited to: the mobile television inspection studio, television camera, sonar, audio-visual digital encoding equipment/software, and other necessary equipment, materials, power, labor, and technicians as needed to perform the television inspection.

B. The surveying/inspecting equipment will be capable of surveying/inspecting a length of sewer up to at least one-thousand five-hundred (1,500) feet when entry onto the sewer may be obtained at each end and up to one-hundred (100) feet by rodding or up to seven-hundred and fifty (750) feet where a self-propelled unit is used, where entry is possible at one (1) end only. This equipment will be maintained in full working order.

C. Each survey/inspection unit will contain a means of transporting the CCTV camera and/or sonar equipment in a stable condition through the sewer under survey and/or inspection. Such equipment will ensure the maintained location of the CCTV camera or sonar equipment when used independently on or near to the central axis of a circular shaped sewer when required in the prime position.

D. Where the CCTV camera and/or sonar head are towed by winch and bond through the sewer, all winches will be stable with either lockable or ratcheted drums. All bonds will be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or sonar equipment. All winches will be inherently stable under loaded conditions. The bonds shall be oriented in such a manner as to enable unhindered extension or retraction through the line. All effort shall be made to prevent damage to the pipe during the television inspection. In the case where damage is caused by the **Contractor**, for any reason, such as would be caused by incorrect deployment of bonds or retrieval of lodged equipment, the cost of repair or remedy shall be borne solely by the **Contractor** and repaired immediately after notification to the **County** within 24 hours. Contractor shall take all necessary precautions to prevent an SSO including bypass pumping.

E. Each unit will carry sufficient numbers of guides and rollers such that, when surveying or inspecting, all bonds are supported away from pipe and manhole structures and all CCTV cables and/or lines used to measure the CCTV camera's head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.

F. Each unit will carry a range of flow control plugs or diaphragms for use in controlling the flow during the survey/inspection. A minimum of one (1) item of each size of plug or diaphragm ranging from the required diameters will be carried.

G. Each survey/inspection unit will have on-call equipment available to carry out the flushing, rodding, and jetting of sewers for “Light Cleaning” See the definition of “Light Cleaning” in Sanitary Sewer Cleaning Specification 02956 for details.

H. Television Inspection: The **Contractor** shall inspect pipelines with pan and tilt conventional television imagery and/or sonar as indicated in the contract documents so as to record all relevant features and defects of the pipeline under inspection. Inspection of pipelines shall be carried out utilizing the **County** approved formats only.

I. External Hard Drive (Videos):

1. Audio portion of videos shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.

2. Store in upright position with temperature range of 45 to 80 degrees F (7 to 27 degrees C).

3. Identify each hard drive with labels showing **County’s** name,

Contractor's name, the inspection period, and project area or sewer segments on the hard drive.

J. Hard Drive Titling:

Each segment shown on the external hard drive should have its own video titled with the beginning and end point of the pipe segment.

K. CCTV Camera Head Prime Position:

The CCTV camera head will be positioned to reduce the risk of picture distortion. In circular sewers the CCTV camera lens and/or sonar head will be positioned centrally (i.e. in prime position) within the sewer. In non-circular sewers, picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera lens head will be positioned looking along the axis of the sewer when in prime position. A positioning tolerance of ± 10% of the vertical sewer dimension will be allowed when the camera is in prime position.

L. CCTV Camera Head Speed:

The speed of the CCTV camera in the sewer will be limited to six (6) inches per second or 30 ft/min for surveys. Similar or slightly higher speed may be used on a case-by-case basis. Stop for a minimum of five (5) seconds at every lateral, defect, or adversity. The speed of scanning sonar will be limited to four (4) inches per second.

M. CCTV Color Camera:

The television camera used for the pipe line inspection shall be one specifically designed for hazardous and corrosive environments and constructed for pipeline inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall adhere to the following requirements:

1. Waterproof and shall be operative in 100% humidity conditions with lens fogging and any conditions that may be encountered in the inspection environment.

2. Self-leveling, color pan and tilt camera(s) to facilitate the survey and inspection of all laterals, including defects such as hydrogen sulfide corrosion in the soffit of sewers and benching or walls of manholes over and above the standard defects that require reporting.

3. A three-hundred sixty (360) degrees rotational scan indicating general condition must be implemented at every fifty (50) feet interval (min.) along sewers, and at manholes and any salient, specified, defect features.

4. The tilt arc must not be less than two-hundred seventy (270) degrees with adjustable supports designed for operation in connection with pipe inspection with a viewing angle of not less than 65 degrees.

5. The view seen by the television camera shall be transmitted to a monitor of not less than 11 inches in size.

6. The travel speed of the television inspection camera (through the pipe) shall be uniform and shall not exceed the maximum speed herein specified.

7. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the **County**; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

8. The adjustment of focus and iris will allow optimum picture quality to be achieved and will be remotely operated.

9. The adjustment of focus and iris will provide a minimum focal range from six (6) inches in front of the camera's lens to infinity.

10. The distance along the sewer in focus from the initial point of observation will be a minimum of twice the vertical height of the sewer.

11. The illumination must be mounted on and turned in the direction of the camera such as to allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing, light sensitivity to be greater than 1.5 lux minimum, minimize reflective glare, remote variable intensity control, provide a clear in-focus picture of entire inside periphery of pipe and the ability to achieve proper balance of tint and brightness.

N. Color CCTV:

All CCTV and/or sonar work will use color CCTV reproduction. CCTV Side Scanning Camera:

The **County** will consider high resolution digital CCTV side scanning cameras if proposed by the **Contractor**. The **County** may not accept the side scanning camera use for this project if the **contractor** cannot provide supporting documents showing previous successful application.

O. The survey/inspection vehicle for general public streets or assessable locations will comprise two (2) distinct separate areas. One (1) of these, designated as the viewing area, will be insulated against noise and extremes

in temperature, include the provision for air conditioning, and will be provided with means of controlling external and internal sources of light in a manner capable of ensuring that the monitor screen display is in accordance with the requirements of this specification. Seating/and or space accommodations will be available to enable additional workers to clearly view the on-site monitor, which will display the survey/inspection as it proceeds.

P. The working area will be reserved for equipment, both operational and stored, and no equipment utilized within the sewer will be allowed to be stored in the viewing area.

Q. The vehicle will be suitable for carrying the survey team and laborers and the equipment necessary to safely perform the work.

R. Off road inspection equipment/easement machine proposed by the **Contractor** shall be reviewed and approved by the **County** before the **Contractor** utilizes said equipment.

PART 3 - GENERAL

3.01 EXECUTION

A. The following guidelines concerning the use of CCTV will be followed:

1. Generally, CCTV alone will be used for internal condition assessment where the depth of flow is less than twenty-five (25%) percent of overall sewer volume at the start of the survey. If the flow volume is greater than 25%, as agreed upon by the **County**, bypass pumping may be required.

B. Confined Space Entry: Crews shall minimize the physical entry into manholes. Manhole entry shall be performed in accordance with Federal, State, Local and any other regulations for confined space entry. Only trained crews and staff may perform confined space entry after obtaining an entry permit. Staff must use safety required equipment, including harnesses, ventilation equipment, etc.

C. The **Contractor** shall make map verifications and record and deliver GIS map corrections as necessary meeting 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.

D. Traffic Control: The work area shall be protected at all times with an adequate number of cones, barricades, flags, certified flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flagmen shall work to secure all affected streets. Further requirement

for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by USDOT/FHWA.

E. Site Security: Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots. Follow all applicable state and local traffic safety procedures. Alert the closest fire department/Emergency Medical Services (EMS) as to the location of the day's work and to stand by for emergencies.

F. Scheduling Time: Crews shall begin inspections after 8:00 am and terminate inspections no later than 5:00 pm each day unless otherwise directed by the **County** in order to address localized special requirements. Authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed by the **Contractor** in time frames complying with the **County's** noise ordinance.

G. Permits for Rights of Ways & Contract Utility Licensing: The **Contractor** shall obtain work permits for all work to be performed in State and/or County Right of Ways. The **Contractor** shall also plan for all other insurances, traffic control measures, and other terms of the permit in advance. The **Contractor** shall also obtain all necessary and applicable licensing.

H. Sequence of Work:

1. Perform Work in the following sequence:

   a. Clean sewer lines and manholes in accordance with "Light Cleaning" requirements of **Section 02956 - Sanitary Sewer Cleaning**.

   b. **Contractor** shall remove debris in accordance with guidance in **Section 02956 - Sanitary Sewer Cleaning**.

   c. After cleaning, the manhole sections shall be visually inspected by means of CCTV. The inspection then will be done one linear section at a time and the flow in the section being inspected will meet the minimum PACP requirements. All CCTV inspections shall be performed in accordance with PACP standards including the specific date and time of inspection.

I. Inspection equipment shall utilize software capable of providing complete survey reports, inspection standard exchange database, and linked media files; equipped with modules necessary for NASSCO Pipeline Assessment and Certification Program inspection.

J. If television inspection of an entire manhole to manhole sewer segment cannot be successfully performed from one manhole, a reverse setup shall be performed to obtain a complete inspection. A reverse setup shall be considered incidental to and included in the segment's unit price bid for CCTV inspection. If upstream (reverse) setup, is required, establish new inspection run separate from downstream (normal) setup so two inspection records exist in the software, one with the normal setup and one with the reverse setup.

K. Televised pipe segment inspection is represented by one manhole-to-manhole pipe segment or other structural access-to-access point; not multiple manhole-to-manhole segments.

L. Show continuous footage reading and other required information on inspections image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).

M. Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.

N. Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.

O. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter and the camera lens becomes obscured, pause inspection until flow subsides. If necessary, reschedule CCTV operation. Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream, i.e., placement of flow plugs or freshwater flushing in pipe.

P. Pan the camera to record the inside of each lateral or connecting pipe and the connection of lateral or connecting pipe to sewer pipeline.

Q. Recordings shall clearly show all defects and observations, and their severity in addition to obvious features, i.e., laterals and joints.

R. Immediately report to the **County** any obstructions restricting flow and causing inspection to be interrupted. Assure the obstruction is documented in the inspection with the appropriate defect code. Document condition with still photographs and begin a reverse inspection setup or inspections of other pipelines to the satisfaction of the **County**.

S. Televise pipe segments from manhole to manhole on same video in continuous run.

1. Video shall clearly show camera starting and ending at manhole, unless defects do not allow it.

2. Do not perform partial televising on one video and then complete run on another video.

3. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by the **County**.

4. If a portion of the **Contractor's** inspection is unacceptable to the **County**, the entire pipe segment shall be deemed unacceptable and the **Contractor** shall re-televise the entire pipe segment at the **Contractor's** sole expense.

T. The **County** may, on occasion, accept a physical inspection not adhering to minimum standards if adverse conditions are encountered and re-inspection is not advised.

3.02 CCTV INSPECTION

A. Data Transfer: Upon completion of CCTV inspection, transfer inspection data to an external hard drive (HD) of sufficient capacity and compatibility with the **County's** equipment and available programs; include code required for proper playback of video file.

B. Labeling: Provide printed label on outside of HD that indicates the following:

1. Name of **County**

2. Project title

3. Date of submittal

4. Inspection company

5. Deliverable number

6. Project assignment area (provided by the **County**)

C. Media:

1. Video:

a. Inspections completed, with a unique filename per manhole to manhole pipe segment inspection.

b. Continuous digital video recordings of the inspection view as it appears on the television monitor shall be taken. The recording shall also be used as a permanent record of defects.

c. The recording shall be MPEG-4. Separate MPEG-4 files shall be created for each pipe. In case of a reverse setup, such inspection shall be stored in a separate inspection record and MPEG file. MPEG files shall be written to External Hard Drive media for delivery to the **County**.

d. MPEG files shall be named according to the following file specification:

TV_[PIPEID]_[Direction]_[MMDDYYYY]_[Incremental Number].mpg

e. The incremental number shall be used if multiple inspections are performed for the same line, such as a reverse inspection setup.

f. The **County**, at its sole discretion, reserves the right to refuse any MPEG, on the basis of poor image quality, excessive bit rates, inconsistent frame rates or any other characteristics that may affect usability by the **County**.

g. The digital video encoding shall include video information that can be reproduced with a video image equal or very close to the quality of the original picture on the television monitor. The replay of the recorded video information shall be free of electrical interference and shall produce a clear, stable image.

2. Audio:

a. Embedded in video file

b. Operator will include description of inspection setup, including related information from log form and unusual conditions

c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal)

d. Verbal description and location of each defect

e. Verbal description and location of each service connection

D. Still Photographs:

1. Provide color digital photographs showing inspection image whenever observation or defect has a moderate or major severity; looking into a

lateral or connection pipe; or unless otherwise instructed by the **County**;

2. Each with a unique filename matching the asset ID with a random number;

3. Encoded in .JPEG format;

4. Minimum 1024 x 768 resolution; and

5. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code (if applicable).

E. Database:

1. Include all inspections in a single consolidated PACP Version 6 or newer Access Standard Exchange database. Creating a database per inspection is not acceptable. Each submittal standard exchange database shall be cumulative containing all prior inspections as well as inspections conducted during interim period since previous submittal.

2. Prior to the start of the Work, provide PACP standard exchange database of collected data including anticipated inspection header field attribute information. A PACP Inspection Header Guidance Table will be provided upon request.

3. File Type: MS Access, .MDB, .ACCDB

4. Database Format: PACP Version 6 or newer. NASSCO PACP data will be exported into Standard PACP Standard Exchange database.

5. List inspection media names in corresponding asset/inspection/defect information field within database.

F. Linear Measurement:

1. The CCTV monitor display will incorporate an automatically updated record in feet and tenths of a foot of the footage of the camera or center point of the transducer, whichever unit is being metered, from the cable calibration point, the pipe diameter (physical measurement by **Contractor**), and verified pipe material. The relative positions of the two (2) center points will also be noted.

2. The **Contractor** shall use a suitable metering devise enabling the cable length to be accurately measured; this shall be accurate to

0.20 feet. The **Contractor** shall use the footage readings to identify location of defects to the nearest 0.10 feet. Measurement shall be zeroed after each segment inspected. The **Contractor** shall calibrate the footage meter on a regular basis and demonstrate that the tolerance is being achieved by tape measurement between manholes on the surface. This taped measurement must be included on a quality control form which will be completed and submitted by the **Contractor** depicting the level of accuracy achieved.

G. Data Display, Recording and Start of Survey/Inspection:

1. At the start of each sewer length being surveyed or inspected and each reverse set-up, the length of pipeline from zero (0) footage, the entrance to the pipe, up to the cable calibration point will be recorded and reported in order to obtain a full record of the sewer length. Only one (1) survey will be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes will be logged on a separate log. Video digits will be recorded so every recorded feature has a correct tape elapsed time stamp. Each log will make reference to a start and finish manhole unless abandonment took place because of blockage.

2. The footage reading entered on to the data display at the cable calibration point must allow for the distance from the start of the survey/inspection to the cable calibration point such that the footage at the start of the survey is zero (0).

3. In the case of surveying through a manhole where a new header sheet and file must be created, the footage will be set at zero (0) with the camera focused on the outgoing pipe entrance.

4. At the start of each manhole length a data generator will electronically generate and clearly display on the viewing monitor and subsequently on the video recording a record of data in alpha-numeric form containing the following minimum information:

   a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0)

   b. Sewer dimensions

   c. Manhole/pipe asset ID number

   d. Date of survey

   e. Road name/location

   f. Direction of survey

   g. Time of start of survey

h. Sewer use (SS - Sanitary Sewer)

i. Material of construction of the pipe

j. The size and position of the data display will be such as not to interfere with the main subject of the picture.

5. Once the survey of the pipeline is under way, the following minimum information will be continually displayed:

a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).

b. Manhole or pipe asset ID number.

c. Defect/observation code(s) (temporarily display when encountered)

d. Date and time

6. Before camera enters the pipe, inspection shall provide video of the manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up toward the manhole opening.

H. Coding: Defect Coding, as well as material, shape, and lining coding, and conventions used will comply with PACP formats and will be compatible with the **County's** GIS.

3.03 DELIVERABLES

A. Final Television Inspection Reports shall be submitted to the **County** in PDF on the same external hard drive referenced above. Corresponding MPEG videos and photos shall also be submitted to the **County** as outlined by this specification.

3.04 QUALITY ASSURANCE/QUALITY CONTROL

A. Data Quality Control Procedure:

1. The **Contractor** shall perform a Quality Control (QC) check of the televised inspection documentation using the QC database provided by the **County**.

2. The **Contractor** shall correct any data conflict, missing data, or other questionable entry identified by the conflict, missing data, or other questionable entry identified by the QC reports prior to submitting the

CCTV inspection data to the **County**.

B. The **Contractor** shall establish and perform a QA/QC analysis addressing all video and data recorded before the data is submitted to the **County**. The **County** will periodically request the **Contractor** to review the QC results with the **County**.

C. The data submissions shall undergo the same random review checks for Quality when submitted to the **County**. Should accuracy or qualitative levels fall below those deemed acceptable to the **County**, the data submittal will be refused and no payment will be released. **Contractor** will be required to correct or re-do inspections until the **County** is satisfied with the work.

3.05 DOCUMENTATION

A. The **Contractor** shall complete work on each asset as described herein. Refer to **Section 01210 - Measurement and Payment** for documentation required with each pay request.

B. Measurement Units: All dimensions will be in feet and inches. Sewer measurement will be to the nearest inch.

C. CCTV and Man-Entry Photographs: Photographs will be taken of all laterals or connecting pipes and moderate or severe pipeline defects. Where a defect is continuous or repeated the photographs will be taken at the beginning of the defect and at not less than ten (10) foot intervals thereafter.

D. The **Contractor** shall complete weekly and end of work television/inspection reports as described herein. These reports shall be per the format and defect codes of NASSCO's Pipeline Assessment and Certification Program (PACP). Prior to beginning work, the **Contractor** shall submit a digital sample of the television inspection report to the **County** for approval.

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.

F. The **Contractor** must cooperate with Owner on all security matters and must promptly comply with any project security arrangements established by the Owner or Program Manager.

G. It is the **Contractor's** obligations to comply with all applicable governmental requirements and regulations and to undertake reasonable actions to establish and maintain secure conditions at any job site.

H. The **Contractor** shall be solely responsible for the safety and security of materials, equipment, their employees, their subcontractors and or any person who enters County's premises for any reason(s) related to this contract.

I. The **Contractor** shall comply with the site safety and security program at all times on the Owner's facilities.

J. The **Contractor** shall only allow entry to authorized persons with proper Owner-approved identification. All Contractor and Subcontractor employees will be required to have personnel working at these facilities photographed for an Owner-provided identification (ID) badge before they start work.

K. The **Contractor** shall not allow cameras on-site or photographs to be taken, except those required to perform the Work in accordance with the Contract

Documents or otherwise approved by Owner. Photos taken on the County property for any reason (mishaps, near misses, accidents etc.) are prohibited from being used for Social Media and Training references unless authorized by the County.

L. It is the responsibility of the **Contractor** to ensure all articles of possible personal or monetary value found by the Contractor's employees are turned into the Owner or Program Manager.

M. The **Contractor** shall be responsible for maintaining satisfactory standards of employees' competency, conduct, courtesy, appearance, honesty and integrity, and shall be responsible for taking such disciplinary action with respect to any employee, as may be necessary.

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

O. **Contractors** with non-English speaking employees shall provide an English speaking person, who has the ability to translate or communicate vital project specific or safety information.

1.02 PROJECT SAFETY

A. DRUG AND ALCOHOL POLICY

Any person under the influence of /or in possession of, distributing and/or selling control substances and/or alcohol will be removed from the site immediately. Prescription medication is allowable if it is contained in its original package and does not affect an employee's performance. DWM has a zero tolerance Drug and Alcohol policy.

B. COMPETENT PERSON REQUIREMENTS

Contractor and their Subcontractor shall have a Competent Person on the project for all operations as required by OSHA Standards.

1. A competent person identified and on-site before any scaffold erection may begin and/or modified.

2. A competent person identified and on-site before any excavation may begin and/or modified.

3. A competent person identified and on-site before any Confined Space may begin.

4. A competent person identified and on-site before any rigging operation may begin.

5. A competent person identified to erect and inspect concrete formwork.

OSHA defines a competent person as one who is capable of identifying existing and predictable hazards in surroundings or working conditions that are unsanitary, hazardous or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

C. COMMUNICATIONS

1. Contractor shall Plan and execute all work in a manner, which complies with the stated objectives of their Project Safety Program.

2. Contractor employees and their subcontractors shall complete a Project Site-Specific Health and Safety Orientation identifying projects hazards, detailing these specified project rules and DeKalb County Watershed Management Project Rules **(See Section C).** Employees shall complete this orientation before starting work.

3. Contractor shall create and maintain for project(s) an emergency action plan (EAP) which addresses the notification of the closet police, fire or ambulance and rescue services.

4. In case of a utility line break please contact 911 in addition to DWM Dispatch at 770-270-6243, the utility owner (Sewer, Water, Gas, Cable, and Electrical) and your project contract public relation representative. Please note: Gas Sewer and Electrical lines are considered Hazardous. Prompt emergency actions must follow immediately.

5. Contractors are required to have on file in the job trailer, a copy of their company's Safety Program and Hazard Communication Program.

6. All accidents must be reported to DWM Management immediately after occurrence. Accident reports and investigation forms must be completed and a copy to DWM Safety within 24 hours of an accident. All incidents or near misses must be reported to DWM Safety immediately for proper investigation and corrective actions to ensure prevention.

7. Contractor's accident/incident report shall contain (but not be limited too) the following:

    a. Name of person injured
    b. Date and time of injury
    c. Name(s) of all witnesses
    d. Details of the accident
    e. Root Cause analysis of accident
    f. Action taken to prevent re-occurrence of incident/accident

g. Nature/Extent of injury

h. Name of doctor/ emergency provider

8. All contractor personnel requiring medical attention shall be drug screened in accordance with the County's policy.

9. Tool Box Talks must be completed at least weekly. The toolbox talk must be documented with the signatures of all employees attending. Topics should include information relative to ongoing or upcoming operations and previous week's accidents.

10. Subcontractors must maintain and have available first aid and bloodborne pathogens kit.

11. Contractors and their subcontractors are responsible for transportation and payment for treatment of their employees. It is the responsibility of each contractor to arrange for medical treatment of his or her injured employees.

12. Contractors and Subcontractors are responsible for the conduct of their employees and housekeeping of the construction/project site.

13. Any damage to existing or stored property or materials will financially be the sole responsibility of the offending subcontractor(s).

D. DISCIPLINARY POLICY

1. Contractor employees must work safely as a condition of employment on this project. DeKalb County reserves the right to remove any contractor employees from this project for unsafe behavior or failure to follow safe work practices. Insubordination or any act that causes an Immediately Dangerous to Life and Health (IDLH) situations will not be tolerated and will result in automatic removal.

E. PROJECT SITE

1. Vehicle parking is in designated areas only- Forward First Policy.

2. Report all unsafe site conditions to DWM Management for which the contractor does not have the resources or is not responsible to implement corrective action.

3. Only trained, certified and authorized employees shall operate forklifts, aerial lifts, cranes, machinery, heavy equipment, tools, and vehicles. All equipment shall be operated in accordance with manufacturer's specifications and all other applicable laws/standards.

The operator must have certification cards on their person.

4. Cell phones are not allowed to be used onsite except for supervisors and management.

5. All subcontractors shall have warning devices on moving equipment and trucks in the proper working order while on site.

F. ELECTRICAL

Subcontractors must use either an assured grounding program and/or Ground Fault Circuit Interrupters (GFCI) for protection from shock/electrocution.

G. HAZARDOUS COMMUNICATION PROGRAM

Contractors are required to have on file with DWM and project job trailer, a copy of their company's Hazard Communication Program. Hazard Communication programs must include an inventory list of hazardous materials, explanation of their labeling system, and all corresponding safety data sheets (SDS) and name of the program coordinator. Contractor shall make the inventory list of hazardous materials available upon request by the County.

1.03 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 require each employee to sign the Employee Acknowledgment of Project Site Rules Log included in **Section C**. 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.

D. 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.

1.04 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**.

1.05 RESTRICTIONS

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

1.06 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.

1.07 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.

1.08 IDENTIFICATION BADGES AND SECURITY

A. All **Contractor’s** employees and subcontractors’ staff who will be working on-site shall be issued an ID badge by the **County**.

B. Special Circumstances. The **County** can grant/permit a **Contractor** the right to badge their employees and subcontractors. However, the badge template shall be approved by **DWM** Safety Division. The ID badge shall include worker’s name, date of issue, picture, and company affiliation.

C. It is the **Contractor’s** responsibility to collect the ID badge from any employee who is been discharged or resign prior to completion of the project as well as at completion of the project. **Contractors** shall return all ID badges to the **DWM** Safety Division within 48 hours. The **Contractor** shall be charged a fee of $25.00 per badge for any badges not returned at completion of the project. For ID badges lost during the term of the project, there will be a reissued fee of $15.00 per ID badge. The **Contractor** shall deduct these charges from its periodic or closeout payment request or the **County** shall deduct them.

D. The **Contractor** shall be responsible for maintaining a safe “drug-free” work environment.

E. The **Contractor** shall develop a Security Plan for use on the job site during construction. The Plan shall encompass at a minimum such topics as the use

of pre-employment background checks for specific project staff, drug tests, crime prevention and anti-theft procedures, workplace violence, and methods to secure project documents. The staff working on the site shall be familiar with the requirements of the Security Plan.

F. County Ordinances prohibit the carrying of weapons on County property/jobsites. The County Police Department shall be notified of any person bringing weapons to the jobsite; they shall be removed immediately and prosecuted.

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

1.09 REMOVAL

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

B. Should the **Contractor** dismiss employees who have been given access to the DWM facilities while the contract is in force, the Contractor will advise the DWM Security Office.

C. The Owner may request the **Contractor** to immediately remove from the premises and/or dismiss any employee found unfit to perform duties due to one or more of the following reasons:

- Neglect of duty, absenteeism, security or safety problems and sleeping on the job.
- Disorderly conduct, use of abusive or offensive language, quarreling, intimidation by words, actions or fighting.
- Theft, vandalism, immoral conduct or any other criminal action.
- Selling, consuming, possessing, or being under the influence of intoxicants, alcohol or illegal substances, which produce similar effects while on duty.
- Involved in a vehicle accident while on the Owner's property or driving the Owner's equipment. No employee, Contractor, or Subcontractor will be extended privileges to drive the Owner's equipment on the Owner's property if driving privileges have been withdrawn by the person's State of residence.

D. All employees will be required to sign in and out on a designated log sheet.

E. All employees shall be required to wear at all times in an observable location, above the waist, on outer clothing, an appropriate photo I.D. badge to be furnished by the Contractor and approved by the Owner.

F. No one under age sixteen is permitted at work sites after normal working hours. Contractor's employees are allowed on work sites only during the specified hours and only when working on this contract. No Contractor employee will be allowed on sites when not specifically working on this Contract's predetermined times and dates.

G. All employees and agents of the Contractor must read the Project Site Rules statement and sign a log acknowledging understanding of project site rules provided in **(Sections A & C)**.

1.10 (DWM) Contractor Badge Procedures

The ID badge will provide proof of authorization to be on the construction site, and aid DWM staff in affirming the contractor's employee has received safety training prior to the start of work at DWM project, site or facility.

A. GENERAL REQUIREMENTS

1. All individuals working on any DeKalb County Department of Watershed Management – construction projects, sites, and facilities shall be required to wear a County issued ID badge.

2. Contractors and subcontractors working on (DWM) projects, sites and facilities must have their assigned badge on their person at all times.

3. All contractors and subcontractors personnel without a current badge will not be allowed to continue to work at a (DWM) project, site or facility.

4. All workers must obtain and display an identification badge issued by the County's Safety Representative **before** reporting to work on any (DWM) construction project.

5. Although a contractor may only be required to visit our sites/property on an infrequent basis, badging is still a requirement.

6. Contractors and subcontractors vendors or their transient onsite visitors, which are not full-time employees of the site, shall be escorted while onsite as a visitor by a Department of Watershed Management badged contractor.

7. Contractors shall maintain a daily sign-in sheet/record/log of their daily workers under its supervision which includes subcontractor's vendors or their transient onsite visitors.

B. TRAINING REQUIREMENTS

1. Contractor and subcontractor employees are required to attend safety training prior to receiving a badge.

2. The **Contractor** is responsible for conduction and/or arrangement of their employee's training.

   a. OSHA 10 hour, OSHA 30 hour or project site-specific safety training along with the contractor receiving a copy of DeKalb County Project Site Rules will suffice the training requirements to receive a badge and start work on the (DWM) construction project(s), site or facility.

   b. OSHA 10 hour and 30-hour safety training received within 12 months prior to the start of work on the (DWM) construction project(s), will qualify as current.

   c. Whereas the OSHA 10 hour and 30-hour training does not expire, the actual date of training must be less than 12 months prior to the start of work on the (DWM) construction project(s) to qualify as "current,"

   d. In the case where the OSHA 10 hour and 30-hour date of training are more than 12 months prior to the start of work on the (DWM) construction project(s), project site-specific safety verification of training is required.

   e. Contractor's training should include general construction safety and the specific safety concerns/hazards employees may encounter at the Watershed Management construction site.

   f. DMW' Safety Division shall review a copy of the contractor's project site-specific safety training topics outline prior to the contractor's employees were approved for badging.

   g. Contractor and subcontractor employees are required to read, understand and agree to abide by DeKalb County Project Site Rules. See **Sections A & C**.

C. VERIFICATION OF TRAINING

1. The contractor's management representative shall complete, sign and send a copy of each of their employee or their subcontractor's

employee a copy of (DWM) Verification of Training Form. **See Section E.**

2. (DWM) Verification of Training Document will be sent to VOTD@DeKalbcountyga.gov prior to the contractor's employee badging date of appointment**.**

3. The contractor's/subcontractor's employee shall review and verify that the information on their individual (DWM) Verification of Training document is correct.

4. The contractor's employee shall also sign (DWM) Verification of Training Form verifying the information on the document is correct. The (DWM) Verification of Training Document signature statement is as follows:

   "I have read, understand and agree to abide by the DEKALB COUNTY PROJECT SITE RULES. I have received a personal copy for my use and reference. Furthermore, I understand that knowingly or purposely falsifying records is grounds for being denied access to the project site."

D. VERIFICATION OF IDENTITY REQUIREMENTS

1. The contractor and subcontractor employees must provide documentation to DeKalb County to verify their identity and authorization to work.

2. DeKalb County only accepts Form I-9 acceptable documents with accompanying photo.

3. I-9 acceptable documents must be from List A and List B (Examples)

   - ID cards issued by federal, state, local governmental agencies
   - TWIC (Transportation Worker Identification Credential)
   - Driver License or Identification card issued by a state motor vehicle department with a photo that clearly identifies the individual.

E. DWM MANAGEMENT SITE INSPECTIONS AND AUDITS

Field verification will be done randomly by the DWM Safety staff to ensure employees were trained and following County, OSHA & State regulations.

F. BADGING OFFICE ADDRESS IS AS FOLLOWS

DeKalb County Watershed Management,
Safety Division
1641 Roadhaven Drive, Stone Mountain, GA 30083

Badging is by appointment only.

G. BADGE EXPIRATION DATE

Badges are valid until the expiration date of the prime contractor's contract.

H. TRANSFER CONTRACTORS

If a worker changes companies or projects, the badge must be surrendered and a new badge will be issued if needed.

If applicable, the new employer will provide the employee certification that the safety training is completed.

Only those employees registered in the badging system are eligible to receive a badge,

After verification by the safety representative, the badging database will be updated and a new badge issued.

I. SPECIAL CIRCUMSTANCES:

The County can grant/permit a Contractor the right to badge their employees and subcontractors. However, the badge template shall be approved by the DWM Safety Division. The ID badge shall include the worker's name, picture, and company affiliation.

J. ADDITIONAL TRAINING REQUIREMENTS:

Additional training requirements may be requested if there is a change in the contractor's scope of work or responsibilities.

K. BADGE REPLACEMENT

The contractor must notify DMW's Safety Division immediately if a badge is lost, stolen or an employee is no longer employed with the contractor.

L. BADGE COLLECTION/ RETURN POLICY

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

SECTION A

VISTOR ACKNOWLEDGMENT OF THE PROJECT SITE RULES

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

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

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

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of County property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing of County property
- Failure to use sanitary facilities
- Knowingly or purposely failing to report accidents/incidents or job-related injuries
- Being under the apparent influence of drugs, alcohol, or other intoxicants or in possession of drugs, alcohol, or other intoxicants on the job site
- Wearing shorts or tennis shoes on the job site
- Failure to wear required personal protective equipment (PPE)
- Gambling, fighting, threatening behavior or engaging in horseplay on the job site
- Smoking in unauthorized areas on the job site
- Open fire cooking or making unauthorized fires on job site
- Selling items or raffles without authorization
- Use of unauthorized cameras on the job site
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area

- Failure to wear designated identification [Site Specific]
- Failure to use designated gates
- Condoning or knowingly allowing a person to engage in or work around a patently unsafe or environmental compromising act or condition
- Knowingly or purposely falsifying records, documents or providing false testimony

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

Print Name **Signature**

Date

SECTION C

EMPLOYEE ACKNOWLEDGMENT OF THE PROJECT SITE RULES

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

PROHIBITED ACTIVITIES

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

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

Print Name **Signature**

Date

SECTION E

DeKalb County Government Training Verification Form

Appointment Date: _____
(Tues./Thurs. 9am-12pm)

_____ _____
Primary Contractor: DeKalb Contract #:

_____ _____
Subcontractor Name: Contract End Date:

□ **Course Name: Site Specific Safety Training in accordance with OSHA 29 CFR 1926 & 1910**
Successfully Completed: □ Yes □ No □ In Progress
Date Completed: _____

□ **Course Name: OSHA 10 Hour**
Successfully Completed: □ Yes □ No □ In Progress
Date Completed: _____

□ **Course Name: OSHA 24 HAZWOPER**
Successfully Completed: □ Yes □ No □ In Progress
Date Completed: _____

□ **Course Name: OSHA 30 Hour**
Successfully Completed: □ Yes □ No □ In Progress
Date Completed: _____

□ **Course Name: OSHA 40 HAZWOPER**
Successfully Completed: □ Yes □ No □ In Progress
Date Completed: _____

I HAVE READ, UNDERSTAND AND I HAVE BEEN PROVIDED A COPY OF THE DEKALB PROJECT SITE RULES. FURTHERMORE, I UNDERSTAND THAT KNOWINGLY OR PURPOSELY FALSIFYING RECORDS IS GROUNDS FOR BEING DENIED ACCESS TO THE PROJECT SITE. BY MY SIGNATURE BELOW, I AFFIRM THE ABOVE INFORMATION IS ACCURATE AND TRUE TO THE BEST OF MY KNOWLEDGE.

_____ _____
Employee's Name (Print): **Employee's Name (Sign):**

_____ _____
Authorized Representative (Print): **Authorized Representative (Sign):**

END OF SECTION

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.

E. Contractor shall comply with DeKalb County Steel Plate for Residential Specification **(See Section A)**.

F. Contractor shall provide a pilot car or an escort vehicle when heavy equipment must be moved from one location to another by use of the roads, streets and through DeKalb County.

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.

E. Only a uniformed police officer can direct traffic when the contractor's operation interfere with or impede the operation of a traffic signal light.

3.06 FLAGMEN

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

B. The contractor flagmen shall have 7' Stop/Slow paddles onsite during all operations involving traffic control.

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.

3.11 BARRICADES AND WARNING SIGNS

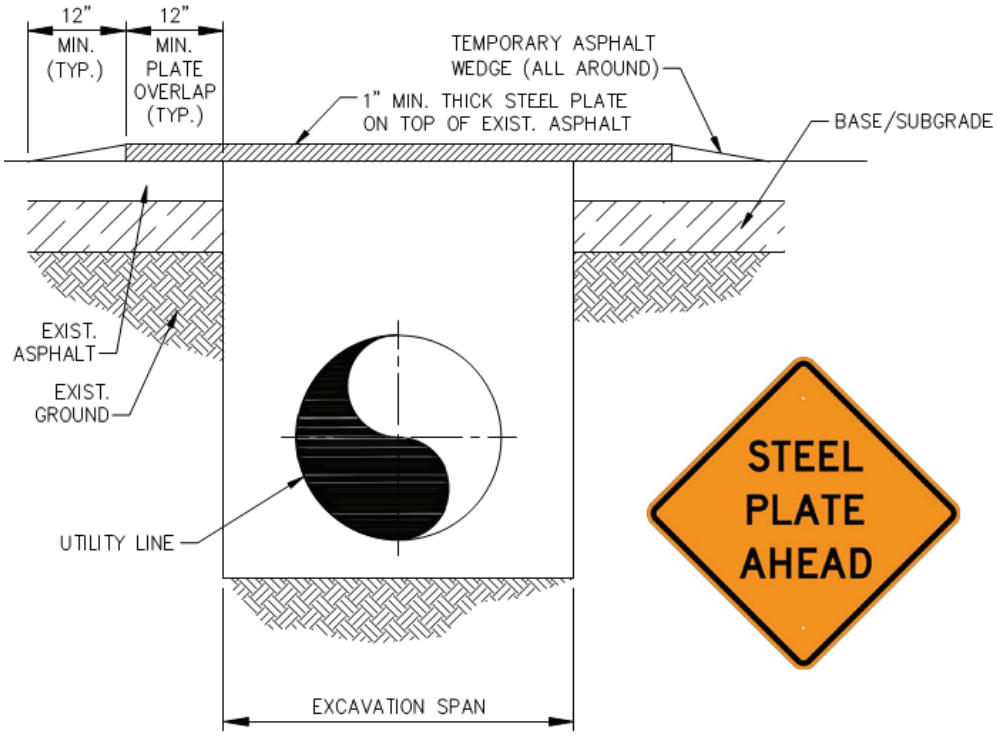
A. The **Contractor** shall furnish, erect, and maintain barricades and warning signs for hazards necessary to protect the public and the Work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated or reflectorized.

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**.

Section A

Steel Plate Installation Urban and Residential



Notes:

1. Installation shall be used in areas where backfilling operations of an excavation in the roadway cannot meet the minimum compaction requirements and permanent patching placement within the same day.
2. All excavations shall be backfilled within the roadway.
3. Each plate is to overlap existing pavement 12” minimum in every direction and multiple plates shall abut and be secured to each other.
4. Each steel plate shall be anchored securely to prevent movement.
5. Temporary paving with a cold asphalt mix or approved equal shall be used to feather edges of the plate to form a wedged taper to cover the edges of the steel plate.
6. The steel plate shall be removed within 30 days of placement with the excavation meeting the minimum compaction requirements and permanent patching installed.
7. Any ditch line needing a steel plate longer than 30 days should have permanent patching.
8. Warning signs advising motorist that they should expect to encounter steel plates shall be placed approximately 100 feet in advance of the steel plate location. The signs shall meet MUTCD sign size requirements, shall state steel plate ahead, and shall be visible to motorist.

END OF SECTION

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**.

1.02 DESIGN REQUIREMENTS

A. Where **Contractor** design is specified, design of installation, systems, equipment, and components, including supports and anchorage shall be in accordance with provisions of 2018 International Building Code (IBC) by International Code Council as amended by the State of Georgia.

1. See "Structural General Notes" sheets on Drawings for Contractor design criteria requirements for loadings such as wind, seismic, soil properties, ground water table, fluid, deflection, settlement, and related design parameters.
2. Concrete anchorage shall be designed in accordance with Chapter 17 of ACI 318-14.

B. Where **Contractor** design is specified, installation, systems, equipment, and components, including supports and anchorage, shall be designed by a qualified professional engineer registered in state where Project will be constructed.

C. Where **Contractor** design is specified, the following submittals shall be sealed,

signed and dated by a registered professional engineer licensed in state where Project will be constructed and competent in the area of practice for the specified design:

1. Shop, fabrication, erection and installation drawings.
2. Calculations

1.03 SUBMITTALS

A. Where **Contractor** design is specified, submit shop, fabrication, erection and installation drawings and calculations, unless otherwise specified.

B. Sealed submittals shall be in accordance with the laws, rules and regulations of state where Project will be constructed.

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 using ultimate design load method.
2. Post-installed anchor bolts shall be designed based on “cracked” concrete conditions for design purposes, unless otherwise demonstrated by calculations.
3. 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)
½	4,500	6,300
⅝	6,900	7,700
¾	10,500	9,900

4. Embedment depth shall be minimum 6 inches for adhesive anchors and 4 inches for mechanical anchors, unless noted otherwise on the Drawings.

D. Anchor Type and Manufacturer

1. Where adhesive anchors are noted on the Drawings, provide ANSI Type 316 stainless steel threaded rod with the one of the following adhesives:
   a. Pure 110+; DeWalt.
   b. HIT RE 500-V3 or HIT HY 200; HILTI North America.
   c. SET-3G; Simpson Strong-Tie.
2. For other applications, provide ANSI Type 316 mechanical anchors from one of the following manufacturers:
   a. DeWalt
   b. Hilti North America
   c. Simpson Strong-Tie
3. Install anchors per manufacturer's printed installation instructions and this Section.
   a. 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 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

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

SECTION 01650

INSTALLATION, TESTING, AND STARTUP SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The **Contractor** shall supply the on-site services of supplies and/or manufacturers' representatives during construction and startup of equipment.

B. The **Contractor** shall include and pay all costs for suppliers/manufacturers' services rendered.

C. Training shall be provided by competent manufacturer’s representatives.

D. Operations and Maintenance manual for all equipment shall be provided by the manufacturer.

1.02 INSTALLATION SERVICES

A. Competent and experienced technical representatives of manufacturers of all equipment and systems shall be provided as necessary to resolve assembly to installation procedures which are attributable to or associated with the equipment furnished.

B. After installation of the equipment/system has been completed and the equipment/system is presumably ready for operation, but before it is operated by others, the manufacturer's representative shall inspect, operate, test, and adjust the equipment/system so equipment/system conforms to specifications and manufacturer's requirements. The inspection shall include, but not be limited to, the following points as applicable:

1. Soundness (without cracked or otherwise damaged parts).

2. Completeness in all details, as specified.

3. Correctness of setting, alignment, and relative arrangement of various parts.

4. Adequacy and correctness of packing, sealing, and lubricants.

C. The operation, testing and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

D. Not later than four days prior to training session, the **Contractor** shall provide the Engineer with three copies of the following for approval:

1. Manufacturer's representatives shall certify the following for each piece of equipment, or each system installed in the work:

   a. That the equipment is installed per the contract specifications.

   b. That nothing in the installation shall void the warranty.

   c. That the equipment, as installed, is ready to be operated by others.

   Use "Certificate of Installation Services" form provided with this section and furnish Engineer with three copies for approval.

2. Submit a detailed report by the manufacturer's representative, for approval by the Engineer, of the startup services performed. The report shall include, but not be limited to:

   a. Results of inspection and operation; quantitative and/or qualitative, as specified.

   b. Description of calibration and adjustments.

   c. Description of any parts replaced and why replaced.

   d. Type, brand name and quantity of lubricant used, if any.

   e. General condition of equipment.

   f. Description of any problems encountered and corrective actions.

   g. Any special instructions left with the **Contractor** or Engineer.

   h. Suggestions for precautions to be taken to ensure proper maintenance.

The report must be approved before startup.

E. After the Engineer has approved the reports from the manufacturer's representatives, the **Contractor** shall make arrangements to have the manufacturer's representatives present when the field acceptance tests are made.

1.03 TRAINING COUNTY'S PERSONNEL

A. The **Contractor** shall furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with the **County**, and familiar with Operations & Maintenance manual information.

B. The **Contractor** shall furnish manufacturers' representatives for detailed classroom and hands-on training to **County's** personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.

C. Manufacturer's Representative shall be familiar with plant operation and maintenance requirements as well as with specified equipment.

D. Pre-startup Training:
   1. The **Contractor** shall coordinate training sessions with **County's** operating personnel and manufacturers' representatives.
   2. Training shall be complete at least 7 days, but no more than 14 days, prior to actual startup.

E. Post-Startup Training:
   1. Respective manufacturers' representatives shall furnish and coordinate training of County's operating personnel.
   2. Manufacturers' representatives shall be required for a follow-up visit of one day.

F. Taping of Training Sessions:
   1. The County will provide audio/video taping of training sessions.
   2. Manufacturer's trainer shall provide appropriate props, such as charts, photographs, and samples in large enough sizes to be videotaped.
   3. Trainers shall provide their full cooperation to the County's video technician.

PART 2 - PRODUCTS

2.01 MATERIALS TESTING

A. Gages, Meters, Recorders and Monitors: Gages, meters, recorders and monitors shall be provided by the **Contractor** as required by the Engineer to supplement or augment the instrumentation system provided under this contract to properly demonstrate that all equipment fully satisfies the requirements of this project manual. All instruments shall be recently calibrated, and the **Contractor** shall be prepared at all times to demonstrate, through recalibration, the uncertainty of all instruments employed for testing purposes. Calibration procedures shall be in accordance with applicable standards of ASTM, ISA and IEEE. The adequacy of all gages, meters, recorders and monitors shall be subject to review of the Engineer.

B. Records: The **Contractor** shall provide sign-off forms for all installed and operational testing to be accomplished under this contract.

The **Contractor** shall maintain a master file of all equipment sign-off sheets, which shall be available for inspection by the Engineer. Upon completion of testing, the **Contractor** shall furnish the Engineer with the original and two copies of the sign-off sheet for each equipment item.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS:

A. All materials, equipment, and work provided in this contract shall be tested and inspected to prove compliance with the contract requirements. The work shall include the equipment supplied by others but installed and/or connected by the **Contractor**. Unless otherwise specified, all costs of testing, including temporary facilities and connections shall be borne by the **Contractor**. For the purpose of this section, "equipment" shall mean any mechanical, electrical, instrumentation, or other device with one or more moving parts or devices requiring an electrical, pneumatic or hydraulic connection. Testing shall be performed in accordance with the requirements of the particular specification sections for the item to be tested.

B. No tests specified herein shall be applied until the item to be tested has been inspected and approval given by the Engineer for the application of such test.

C. Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the recognized standards of the industry.

D. The form of evidence of satisfactory fulfillment of delivery acceptance test and of installed test and inspection requirements shall be at the discretion of the Engineer, either by tests and inspections carried out in his presence or by certificates or reports of tests and inspections carried out by approved persons or organizations. The **Contractor** shall provide and use forms that include all test information, including specified operational parameters, and shall be acceptable in content to the Engineer.

3.02 DELIVERY ACCEPTANCE TESTS AND INSPECTIONS

A. The delivery acceptance tests and inspections shall be at the **Contractor**'s expense for any materials or equipment specified herein and shall include the following:

1. Test of items at the place of manufacture during and/or on completion of manufacture, comprising material tests, hydraulic pressure tests, electric and instrumentation subsystem tests, performance and operating tests and inspections in accordance with the relevant standards of the industry.

2. Inspection of all items delivered at the site or to any authorized place of storage in order that the Engineer may be satisfied that such items are of the specified quality and workmanship and are in good order and condition at the time of delivery. To that end, the **Contractor** shall be prepared to remove all coverings, containers, or crates to permit the Engineer to conduct his inspection. Should the Engineer find, in his opinion, indication of damage or deficient quality of workmanship, the **Contractor** shall provide the necessary documentation or conduct such tests deemed necessary by the Engineer to demonstrate compliance.

3.03 INSTALLED TESTS AND INSPECTIONS

A. General: All equipment shall be tested by the **Contractor** to the satisfaction of the Engineer before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned, adjusted, and connected. Any changes, adjustments, or replacements required to make the equipment operate as specified shall be carried out by the **Contractor** as part of the work.

B. Initial Operation: Once all affected equipment has been subjected to a pre-operational checkout, and the Engineer has witnessed and has not

found deficiencies in that portion of the work, individual systems may be started and operated under simulated operating conditions to determine as nearly as possible whether the equipment and systems meet the requirements of these specifications.

1. Potable water shall be employed for testing. The **Contractor** shall bear all expenses to pump or pipe it to the tested systems. The equipment shall be operated a sufficient period of time to determine machine operating characteristics, including temperatures and vibration; to observe performance characteristics; and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as power, flushing or cooling water or control air which have not yet been placed in service, the **Contractor** shall provide acceptable substitute sources, capable of meeting the requirements of the machine, device or system, at no additional cost to the **County**. Disposal methods for test media shall be subject to review by the Engineer.

2. If while under test any portion of the work should fail to fulfill the contract requirements and is adjusted, altered, renewed or replaced, tests shall, if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions. The **Contractor** shall pay to the **County** all reasonable expenses incurred by the **County** as a result of repeating such tests.

3. Once initial operation has been completed, all machines shall be rechecked for proper alignment, realigned if necessary, and doweled in place. All equipment shall be checked for loose connections, unusual movement or other indications of improper operating characteristics. Any deficiencies shall be corrected to the satisfaction of the Engineer. All machines or devices which exhibit unusual or unacceptable operating characteristics shall be disassembled and inspected. They shall then be repaired or removed from the site and replaced at no cost to the **County**.

4. Test results shall be within the tolerances set forth in the detailed specification sections of this project manual. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. **Contractor** shall permanently list all testing tolerances on the piece of equipment being tested. Where, in the case of an otherwise satisfactory installed test, any doubt, dispute, or difference should arise between the Engineer and the **Contractor** regarding the test results or the methods or equipment used in the performance of such test, the Engineer may order the

test to be repeated. If the repeat test, using such modified methods or equipment as the Engineer may require, substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the **County**; otherwise the costs shall be borne by the **Contractor**. Where the results of any installed test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by the **Contractor** at his expense.

5. The **Contractor** shall provide at no expense to the **County**, all utilities, supplies, labor and all other necessary items and work required to complete all tests and inspection specified in this section. The **Contractor** shall provide at no expense to the **County** temporary heating, ventilating and air conditioning for any areas requiring it in the case where permanent facilities are not complete and operable at the time of installed tests. Temporary facilities shall be maintained until permanent systems are in service.

C. Operational Testing: After completion of all installed testing and certification by the Engineer that all equipment complies with the requirements of the specifications, the **Contractor** shall fill all process systems and units with the specified fluid.

1. Upon completion of the filling operations, the Contractor shall operate the completed systems and processes for a period of not less than 72 hours, during which all systems shall be operated as a complete facility at various operating conditions, as directed by the Engineer. Should the operational testing period be halted for any reason related to the facilities constructed or the equipment furnished under this contract, or the Contractor's temporary testing systems, the operational testing program shall be repeated until the specified continuous period has been accomplished without interruption. All process units and systems shall be brought to full operating conditions, including temperature, pressure, and flow.

2. All costs for water, fuel, power, and chemicals required during this test shall be borne by the **Contractor**.

3. Process systems and units shall mean all materials and equipment provided in this contract.

3.04 SYSTEM OPERATIONAL TESTING

A. The duration of the pumping station operational tests for the facilities

shall be at least 72 hours. Each day the complete facility shall be operated for at least 8 continuous hours. During the 72-hour period, the **Contractor** shall demonstrate the operation of all equipment and all systems installed under this contract. System commissioning shall commence, with the approval of the Engineer, upon completion of the operational testing of each portion of the facility, system, or subsystem.

3.05 COMMISSIONING

A. After completion of all installed and operational testing, the **Contractor** shall make written application to the Engineer for permission to demonstrate compliance of the equipment, structures, and systems furnished and installed under this contract with all requirements of this project manual. Such application shall be furnished to the Engineer not less than 7 days prior to the commissioning date.

B. Upon receipt of written permission from the Engineer, and on the agreed upon date, the **Contractor** shall do all things necessary to effect the release of fluid into the facility and to permit adequate operation of the facilities.

C. The **Contractor** shall allow for a commissioning period of at least 30 days satisfying the Engineer that the contract requirements have been fulfilled. The commissioning period may be broken into several segments comprising complete systems at the discretion of the Engineer.

D. During the commissioning period, the **County** will provide staff for operation and maintenance of the facility. The **Contractor** shall provide fulltime (8 hours per day for 5 days per week) and on-call (remaining time of 24 hours, 7 days per week) coordinator service to coordinate other **Contractor** personnel including equipment manufacturer service representatives for troubleshooting, training of **County** personnel, or repair and maintenance of equipment within the terms of the contract. **Contractor** provided personnel for troubleshooting, repair or maintenance of equipment shall be provided as soon as possible and in no case longer than 8 hours after notification to the **Contractor**'s coordinator. Such coordinators shall be familiar with the facility equipment and operations and shall be acceptable to the Engineer. "Coordinator service" shall mean attendance at the site for whatever period is required at whatever time necessary in response to a request from the Engineer. In addition, the **Contractor** shall provide the services of one laborer (8 hours per day for 5 days per week) during the commissioning period to assist **County** personnel in general cleanup

and maintenance.

E. All costs during commissioning shall be the **Contractor's** responsibility.

END OF SECTION

CERTIFICATE OF INSTALLATION SERVICES

Project: _____

Equipment: _____

Specification Section: _____
Contract: _____

The equipment/system named above has been inspected by the Supplier's/Manufacturer's representative and he hereby certifies:

1. That the equipment/system is installed per the contract specifications.
2. That nothing in the installation shall void the warranty.
3. That the equipment/system as installed is ready to be operated by others.

MANUFACTURER'S REPRESENTATIVE

Signature: _____ Date _____

Name (print):_____

Title: _____

Representing: _____

CONTRACTOR

Signature: _____ Date _____

Name (print): _____

Title: _____

Attach the detailed report called for by specification Section 01650 subparagraph 1.02 and submit three copies to Engineer.

This form shall be completed and submitted to Engineer 24 hours prior to training of **County**'s personnel.

SECTION 01664

TRAINING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Reference **01650 - Installation, Testing, and Startup Services**.

B. This section contains requirements for training **County** personnel by persons retained by the **Contractor** specifically for the purpose, in the proper operation and maintenance of the equipment and systems installed under this Contract.

1.02 QUALITY ASSURANCE

Where required by the detailed specifications, the **Contractor** shall provide on-the-job training of **County** personnel. The training sessions shall be conducted by qualified, experienced, factory-trained representatives of the various equipment manufacturers. Training shall include instruction in both operation and maintenance of the subject equipment.

1.03 SUBMITTALS

The following information shall be submitted to the **County** in accordance with **Section 01300 - Submittals**. The material shall be reviewed and accepted by the **County** as a condition precedent to receiving progress payments in excess of 75% of the Contract amount and not less than 3 weeks prior to the commencement of training.

PART 2 - PRODUCTS

2.01 GENERAL

Where specified, the **Contractor** shall conduct training sessions for the **County**'s personnel to instruct the staff on the proper operation, care, and maintenance of the equipment and systems installed under this contract. Training shall take place at the site of the Work after the equipment has been installed and tested and under the conditions specified in the following paragraphs. Approved operation and maintenance manuals shall be available at least 30 days prior to the date scheduled for the individual training session.

2.02 LOCATION

Training sessions shall take place at the site of the Work.

2.03 FORMAT AND CONTENT

A. Each training session shall be composed of time spent both in the classroom and at the specific location of the subject equipment or system. As a minimum, training sessions shall cover the following subjects for each item of equipment or system:

1. Familiarization:

a. Review catalog, parts lists, drawings, etc., previously provided for the plant files and operation, and maintenance manuals.

b. Check out the installation of the specific equipment items.

c. Demonstrate the installed unit and indicate how each part of the Specifications is met.

d. Answer questions.

2. Safety:

a. Using material previously provided and installed equipment, review safety references.

b. Discuss proper precautions around equipment.

3. Operation:

a. Using material previously provided and installed equipment, review reference literature.

b. Explain the modes of operation (including emergency).

c. Check out **County** personnel on proper use of the equipment.

4. Preventive Maintenance:

a. Using material previously provided and installed equipment, review preventive maintenance lists, including

i. Reference material shall indicate easy-to-find resources used.

ii. Daily, weekly, monthly, quarterly, semi-annual, and annual maintenance jobs shall be explained.

b. The **Contractor** shall show how to perform preventive maintenance.

c. The **Contractor** shall show **County** personnel what to look for as indicators of equipment problems.

5. Corrective Maintenance:

a. List possible problems.

b. Discuss repairs and point out special problems.

c. Open up installed equipment and demonstrate procedures, where practical.

6. Parts:

a. Show how to use previously provided parts list and order parts.

b. Look over spare parts on hand. Make recommendations regarding additional parts that should be available.

7. Local Representatives:

a. List Where to Order Parts: Name, address, and telephone.

b. Service Problems:

i. Who to call.

ii. How to get emergency help.

8. Operation and Maintenance Manuals:

a. Review any other material submitted.

b. Update material, as required.

PART 3 – EXECUTION

3.01 GENERAL

A. Training shall be conducted in conjunction with the operational testing and commissioning periods. Classes shall be scheduled such that classroom sessions are interspersed with field instruction in logical sequence. The **Contractor** shall arrange to have the training conducted on consecutive days, with no more than 6 hours of classes scheduled for any single day. Concurrent classes shall not be allowed. The **Contractor**/Manufacturer is to plan for up to three classes in any 24-hour period to properly train each shift.

B. Acceptable operation and maintenance manuals for the specific equipment shall be provided to the **County** prior to the start of any training. Videotaping shall take place concurrently with training sessions.

C. The following, and additional, services shall be provided for each item of equipment or system as required in individual specification sections.

1. At a minimum, classroom equipment training for operations personnel shall include:

a. Using slides and drawings, discuss the equipment's specific location in the plant and provide an operational overview.

b. Discuss the purpose and plant function of the equipment, demonstrating a working knowledge of the operating theory of the equipment.

c. Discuss or demonstrate startup, shutdown, normal operation, and emergency operating procedures, including a discussion on system integration and electrical interlocks, if any.

d. Identify and discuss safety items and procedures.

e. Explain routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.

f. Demonstrate operator detection, without test instruments, of specific equipment trouble symptoms.

g. Show required equipment exercise procedures and intervals.

h. Denote routine disassembly and assembly of equipment, if applicable (as judged by the **County** on a case-by-case basis) for purposes such as operator inspection of equipment.

2. At a minimum, hands-on equipment training for operations personnel shall include:

a. Identify location of equipment and review the purpose.

b. Identify piping and flow options.

c. Identify valves and their purpose.

d. Identify/discuss instrumentation:

i. Location of primary element

ii. Location of instrument readout

iii. Purpose, basic operation, and information interpretation

e. Discuss, demonstrate, and perform standard operating procedures and routine checks.

f. Discuss and perform the preventive maintenance activities.

g. Discuss and perform startup and shutdown procedures.

h. Perform the required equipment exercise procedures.

i. Perform routine disassembly and assembly of equipment, if applicable.

j. Identify and review safety items and perform safety procedures, if feasible.

3. Classroom equipment training for the maintenance and repair personnel shall include:

a. Discuss theory of operation.

b. Examine description and function of equipment.

c. Discuss startup and shutdown procedures

d. Review normal and major repair procedures.

e. Discuss equipment inspection and troubleshooting procedures, including the use of applicable test instruments and the "pass" and "no pass" test instrument readings

f. Understand routine and long-term calibration procedures.

g. Review safety procedures.

h. Discuss preventive maintenance such as routine lubrication; normal maintenance such as belt, seal, and bearing replacement; and major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.

4. Hands-on equipment training for maintenance and repair personnel shall include:

a. Locating and identifying equipment components.

b. Reviewing the equipment function and theory of operation.

c. Reviewing normal repair procedures.

d. Performing startup and shutdown procedures.

e. Reviewing and performing the safety procedures.

f. Performing **County**-approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

Substantial Completion procedures

Final completion procedures

Warranties

Final cleaning

Repair of the Work

Specific closeout and special cleaning requirements for the Work in those Sections

SUBMITTALS

Submit the following shop drawings in accordance with **Section 01300 - Submittals**:

Product Data: For cleaning agents.

Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

Certified List of Incomplete Items: Final submittal at Final Completion.

Certificates of Release: From authorities having jurisdiction.

Certificate of Insurance: For continuing coverage.

Field Report: For pest control inspection.

Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

SUBSTANTIAL COMPLETION PROCEDURES

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.

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.

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.

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.

Submit closeout submittals specified in individual Divisions 02 through 16 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

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.

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.

Submit test/adjust/balance records.

Submit sustainable design submittals required in Division 01 (sustainable design requirements Section) and in individual Division 02 through 16 Sections.

Submit changeover information related to **County's** occupancy, use, operation, and maintenance.

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.

Advise the **County** of pending insurance changeover requirements.

Make final changeover of permanent locks and deliver the keys to **County**. Advise the **County's** personnel of changeover in security provisions.

Complete startup and testing of systems and equipment.

Perform preventive maintenance on equipment used prior to Substantial Completion.

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.

Advise **County** of changeover in heat and other utilities.

Participate with **County** in conducting inspection and walkthrough with local emergency responders.

Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

Remove labels that are not permanent labels.

Complete final cleaning requirements, including touchup painting.

Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

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.

Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

Results of completed inspection shall form the basis of requirements for final completion.

STARTING OF SYSTEMS

Conform to the requirements of sections within Division 1.

Coordinate schedule for start-up of various equipment and systems.

Notify **County** (seven) days prior to start-up of each item.

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.

Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

Verify wiring and support components for equipment are complete and tested.

Execute start-up under supervision of applicable manufacturer's representative, **Contractors'** personnel, and **County** in accordance with manufacturers' instructions.

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.

DEMONSTRATION AND INSTRUCTIONS

Conform to the requirements of **01650 - Installation, Testing, and Startup Services**.

For equipment or systems requiring seasonal operation, perform demonstration for other season within (six) months.

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.

Demonstrate start-up, operation, control, adjustment, troubleshooting, 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**.

Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

Required instruction time for each item of equipment and system is specified in individual sections.

TESTING, ADJUSTING, AND BALANCING

A. The **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 an independent firm to the **County** indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

PROJECT RECORDS DOCUMENTS

The **Contractor** shall record any actual revisions to the Work and maintain one set of the following Project Record Documents on Site:

Contract Drawings, Specifications, and Addenda.

Change Orders, Field Orders, and other written notices.

Shop drawings, Product data, and samples.

Records of surveying and layout Work.

Project Record Drawings.

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.

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.

The **Contractor** shall note any changes made during construction by any of the **Contractor's** forces or those of any subcontractors.

The **Contractor** shall dimension the locations of buried or concealed Work, especially piping and conduit, with reference to exposed structures.

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.

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.

For Project Record Documents and Record Shop Drawings, the **Contractor** shall legibly mark each item to record actual construction, including:

Field changes of dimensions and details.

Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

Measured locations of internal utilities and appurtenances that are concealed in construction, referenced to visible and accessible features of the Work.

Any Changes in the Work from the contract documents.

The location of concealed mechanical services and electrical main feeders, junction boxes, and pullboxes.

Upon completion of the Work, the **Contractor** shall prepare two DVD-ROM or USB thumb drive sets of the Record Shop Drawings and an index.

The **Contractor**-prepared Record Shop Drawings DVD-ROM index shall identify the **County's** project number, project name, and Contract number and the contents of each DVD in the format listed below.

The index shall include the following columns of information for each Record Shop Drawing:

DVD number

Specification Section number

Specification title

Shop drawing transmittal number

Shop drawing equipment description including preselected Equipment vendor and supplier.

The index shall be printed by the following two sorts:

Primary sort: Specification Section number. Secondary sort: shop drawing transmittal number.

Primary sort: DVD number. Secondary sort: Specification Section number.

The index shall be generated using Microsoft Excel software. A copy of the electronic file shall be furnished to the **County**.

The **Contractor** shall provide a set of Project Record Documents on DVD-ROM or USB thumb drive in an electronic format compatible with the plant DVD-ROM record standards. All drawings are to be provided electronically on DVD-ROM in both AutoCAD (latest version) and Adobe Acrobat PDF (latest version). Also provide a set of DVD-ROMs containing the software implemented on this project, including

standard software and custom application software. Also provide a set of DVD-ROMs containing the various programming tools and files necessary for maintenance, editing, backing up, and restoring programmable equipment implemented on this project.

EQUIPMENT INVENTORY SPREADSHEET

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 DVD by the **Contractor**.

EQUIPMENT PREVENTIVE MAINTENANCE SPREADSHEET

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 DVD by the **Contractor.**

PROTECTING INSTALLED CONSTRUCTION

Protect installed Work and provide special protection where specified in individual specification sections.

Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting them with durable sheet materials.

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.

Prohibit traffic from landscaped areas.

SPARE PARTS AND MAINTENANCE PRODUCTS

Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

Deliver to location as directed by **County**; obtain receipt prior to final payment.

Crate in containers designed for prolonged storage suitable for handling with hoisting equipment containers:

Stencil on containers:

Manufacturer/supplier name

Unit name

Spare part name

Manufacturer catalog number

Other identifying information

Precautionary information

FINAL COMPLETION PROCEDURES

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

Submit a final Application for Payment according to Division 1.

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.

Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

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.

Reinspection: Request reinspection when the Work identified in previous inspections as incomplete has been completed or corrected.

LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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.

Organize the list of spaces in sequential order, starting with exterior areas first, and proceeding from the lowest floor to highest floor.

Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

Include the following information at the top of each page:

Project name

Date

Name of **Contractor**

Page number

Submit list of incomplete items in the following format:

PDF electronic file. **County** will return annotated file.

Three paper copies. **County** will return two copies.

SUBMITTAL OF PROJECT WARRANTIES

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.

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**.

Organize warranty documents into an orderly sequence based on the table of contents of Contract Documents.

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.**

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.

Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of **Contractor**.

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.

Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

MATERIALS:

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.

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

FINAL CLEANING

General: Perform final cleaning as directed by the **County.**

Pest Control: Comply with pest control requirements in Division 01, Section, Temporary Facilities and Controls. Prepare and submit a written report to the **County**.

Construction Waste Disposal: Comply with waste disposal requirements in Division 1 and meet local laws.

REPAIR OF THE WORK

Complete repair and restoration operations before requesting inspection for determining Substantial Completion.

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.

Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

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.

Replace parts that have been subjected to operating conditions during construction that could impede operation or reduce longevity.

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.

ADJUSTING

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

END OF SECTION

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 continue 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

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. 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

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**.

No Blasting shall occur until the Contractor has received written approval from the County. The Contractor shall notify the County in writing the date, time of day of the first blast, and the duration the blasting is to occur.

B. Related Work Specified Elsewhere:

1. Section 01380 - Photographic Documentation
2. Section 02000 - Site Work
3. Section 02140 - Dewatering
4. Section 02200 - Earthwork
5. Section 02324 - Trenching and Trench Backfill

C. Definitions:

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.

1.02 GENERAL

A. Perform blasting only with permits from the appropriate jurisdictional agencies. Necessary permits include an Explosives License issued by the Georgia Safety Fire Commissioner, and users' permits obtained from **DeKalb County**. Obey all local, State, Federal and other Governmental regulations applying to transportation, handling, storage and use of explosives, including the requirements of the DeKalb County Fire Department, the State of Georgia and applicable regulations of the Occupational Safety and Health Administration.

B. Perform blasting operations in trenches, shafts and other open excavations only during daylight hours. Perform blasting operations only during the hours 7:00 a.m. to 7:00 p.m. No blasting shall be performed on Saturdays, Sundays or on the public holidays observed by the **County**. If an emergency prevents a blast being fired during the permitted hours and the holes are loaded, the blast shall be fired as soon as safety allows. In the event that blasting is found necessary outside the permitted hours, the Contractor shall receive approval from the **County** and inform local residents within hearing and vibration range 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 constantly monitor 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 text 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. **Contractor** is expressly advised that the protection of buildings, structures, bridges, utilities, and related work adjacent and in the vicinity of its operations, wherever they may be, is solely its responsibility. Existing condition inspection of buildings, bridges or other structures in the immediate vicinity of any blasting operations shall be performed by and be the responsibility of the **Contractor**. The inspection corridor shall extend within a 500-foot radius of all proposed blasting operations. The **Contractor** shall retain an independent consultant, specializing in preconstruction surveys, to conduct the required inspections. The video survey and inspections shall conform to the requirements of **Section 01380 - Photographic Documentation**.

2. Prior to the start of blasting operations, the **Contractor** shall have the independent preconstruction survey consultant, make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by blasting or other operations. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the owners or agents of adjacent buildings, structures, facilities, etc., and to the satisfaction of the **County**. This does not preclude conforming to the requirements of the insurance underwriters. Two (2) copies of surveys, photographs, videos, reports, etc., shall be submitted to the **County**.

3. The cost of all pre-construction video surveys and inspections shall be borne by the **Contractor**.

1.03 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements Conditions of the Contract Documents and **Section 01300 - Submittals**. In addition, the following specific information shall be provided:

1. At least sixty (60) days prior to commencement of blasting operations, the **Contractor** shall provide 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, the **Contractor** shall prepare 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, the **Contractor** 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;

    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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. Requirements for removal and abandonment of site utilities are specified in **Section 02000 - Site Work**.

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

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

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 02200 - Earthwork** and **Section 02324 - Trenching and Trench Backfilling.**

C. The **Contractor** shall level and contour surfaces to elevations and gradients indicated on the Plans.

D. The **Contractor** shall add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. The **Contractor** shall add water to assist compaction. If excess water is apparent, the **Contractor** shall remove aggregate and aerate to reduce moisture content.

F. The **Contractor** shall use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.03 TOLERANCES

A. Flatness: Maximum variation of one-quarter (¼) inch measured with a ten (10) foot metal straight edge.

B. Scheduled Compacted Thickness: Within one-quarter (¼) inch.

C. Variation from True Elevation: Within one-half (½) 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

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 seven (7) days before beginning construction work for any area.

B. Materials to be cleared, grubbed and removed from the project site include but are not limited to vegetation, trees, stumps, roots, lawns, shrubbery, gardens, paving, miscellaneous structures, debris, and abandoned utilities to the minimum practicable extent to complete the work. Limit clearing to a single lane work route without provision for construction vehicles to pass utility operation. Determine and stake limitations of construction easement or right-of-way prior to commencement of work and keep construction activity within such limits.

C. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all areas to be graded so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking 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**.

3.03 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.

3.04 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.

END OF SECTION

SECTION 02112

ROUTE CLEARING

PART 1 – GENERAL

1.01 SCOPE

A. The extent of route clearing is that minimum degree of clearing necessary to carry out construction activities such as pipe bursting, pipe repairs and other pipeline renewal processes including construction of appurtenances, as well as other additional clearing needed for access purposes. The route clearing shall not exceed the easement, temporary easement or the signed right of entry agreement.

B. The **Contractor** shall endeavor to minimize disruption to the neighborhood and shall adjust route-clearing plans to avoid important landscaping features where practicable.

C. Route clearing operations include, but are not limited to, the following:

1. Protecting existing trees and other vegetation
2. Removing trees and other vegetation
3. Clearing
4. Removing above-grade improvements
5. Removing underground improvements
6. Restoring damaged improvements
7. Protecting above-grade and underground improvements
8. Controlling erosion in disturbed areas

1.02 QUALITY ASSURANCE

A. The **Contractor** shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state, or federal authorities having jurisdiction over the Project. The **Contractor** shall obtain all required permits of a temporary nature for construction operations.

B. Burning of cleared or any other materials on site is not permitted. The **Contractor** shall remove material arising from any necessary clearing and grubbing.

1.03 JOB CONDITIONS

A. Protection of Existing Improvements:

1. Provide barricades, coverings, or other types of protection necessary to prevent unnecessary damage to existing improvements.

2. Protect improvements on adjoining properties as well as those on the project site. Restore improvements damaged by this work to their original condition, as acceptable to the Owners or other parties or authorities having jurisdiction. Replace property line monuments (such as iron pins) removed or disturbed by clearing operations. This work shall be performed by a Land Surveyor licensed in the State of Georgia. A submittal is required with data showing the survey and sealed by the licensed land surveyor.

B. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip lines, excess foot or vehicular traffic, or parking of vehicles or equipment within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation to be left standing.

2. Provide protection for tree roots over 1-1/2 inches in diameter that are cut during any construction operation. Coat the cut faces with emulsified asphalt, or other acceptable coating, especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots of trees with wet burlap to prevent roots from drying out; provide earth cover as soon as possible.

3. Repair or replace unnecessarily damaged trees and vegetation, as determined by the **County**, resulting from any construction operation, in a manner acceptable to the property owner and the **County** at the **Contractor's** expense. A qualified arborist shall perform tree damage repair. Replace unnecessarily damaged trees that cannot be repaired and restored to full-growth status, as determined by the arborist.

C. Protection of Adjacent Property:

1. Protect improvements, trees and vegetation on adjoining property as well as those on property requiring route-clearing work.

2. Execute work so as not to create a nuisance to any person including persons utilizing adjacent property.

3. Use work methods and provide temporary facilities as necessary to prevent washing, erosion, siltation or dust damage, or hazard to persons and property, within and off the work area.

PART 2 – PRODUCTS
2.01 EQUIPMENT

A. The **Contractor** shall furnish equipment of the type normally used in clearing and grubbing operations including, but not limited to, tractors, trucks, loaders, mowers, and clippers.

PART 3 – EXECUTION
3.01 CLEARING

A. Route clearing operations shall begin no more than seven days before beginning construction work for any area.

B. Materials to be cleared, grubbed and removed from the project site include but are not limited to vegetation, trees, stumps, roots, lawns, shrubbery, gardens, paving, miscellaneous structures, debris, and abandoned utilities to the minimum practicable extent to complete the work. Limit clearing to a single lane work route without provision for construction vehicles to pass utility operation. Accurately determine limitations of the construction easement or right-of-way and keep construction activity within such limits.

C. Grubbing shall consist of completely removing roots, stumps, trash and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil 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. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.

E. Landscaping features shall include, but are not necessarily limited to: fences, cultivated trees, and cultivated shrubbery. Property corners, man-made improvements, and subdivision and other signs shall be moved off the easement. The **Contractor** shall take extreme care in moving landscape features and shall reestablish these features as directed by the **County**.

F. Surface rocks and boulders shall be grubbed from the soil and removed from the site if not suitable as riprap.

G. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

H. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

I. All fences adjoining any excavation or embankment that, in the **Contractor**'s opinion, may be damaged or buried, shall be carefully removed, stored, and replaced. Any fencing that, in the **County**'s opinion, is significantly damaged

shall be replaced with new fence material of equal or better quality and construction. The **Contractor** shall be responsible for the cost of the new fence material if the **County** deems the **Contractor** was negligent.

J. Stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities that extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material.

K. The **Contractor** shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the limits of any temporary easements, but not directly within the permanent easements. The **Contractor** shall be held liable for any damage the **Contractor**'s operations have inflicted on such property.

L. The **Contractor** shall be responsible for all damages to existing improvements outside the permanent easement resulting from **Contractor**'s operations.

M. Remove lawn sod by cutting into the maximum size that can be handled without tearing or stripping sod and the underlying topsoil. Store it for use in restoring the surface area. Water the sod and otherwise maintain it in viable, growing condition. Alternative means of lawn sod replacement may be considered by the **County**.

N. Remove above-grade structures only where specifically authorized.

O. Remove conflicting fences and provide effective, temporary measures to prevent domestic animals from wandering to other lands. Reconstruct fences promptly.

P. Remove abandoned underground facilities such as utilities and structures, walls, footings, basements, wells, septic tanks, cisterns, underground pipe, and other items that conflict with construction.

3.02 HOLES AND DEPRESSIONS

A. Fill holes, depressions, and voids created or exposed by clearing operations with non-organic soil material, unless further excavation or earthwork is indicated.

B. Place fill material in horizontal layers not exceeding six (6) inches loose-depth and thoroughly compact to a density at least equal to the adjacent original ground.

3.03 DISPOSAL OF WASTE MATERIALS

A. Disposal General Requirements: Accomplish disposal of cleared matter daily so as to maintain site in a safe and neat condition throughout the contract period. Owners of the property may remove merchantable timber, buildings,

or other items of value from the work site before the **Contractor** begins operations, and no assurance exists that any such material shall be on the work site when the **Contractor** begins work.

B. On-Site Disposal:

1. Unless a property owner requests complete removal, cut tree trunks and limbs, over two inches in diameter, into forty-eight (48) inch lengths and neatly stack within work limits having the same property ownership as that on which the tree originally grew.

2. On undeveloped property, distribute brush, trees and limbs less than two inches in diameter, within the work area from which cut, in such a way as not to be objectionable to the property owner. On developed property, remove all such clearing waste and properly dispose of it off-site.

3.04 DISPOSAL OF DEBRIS

The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the **Contractor** and shall be disposed of in accordance with all requirements of federal, state, county, and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner with an approved permit from the **County**. In no case shall any material or debris of any kind be left on the Project, shoved onto abutting private properties, or buried on the Project.

3.05 CONSTRUCTION ACCESS ROUTE ON EASEMENT

A. When directed by the **County**, a construction access route shall be built on the sewer easement for the purpose of accessing manholes and performing all other necessary work within the easement.

B. Construction access route shall be cut a minimum of ten (10) feet wide, and six inches (6) 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 - Temporary and Permanent Erosion and Sediment Control**.

D. Surge stone shall be four to six (4” to 6”) inch size riprap type stone, or equivalent. The **Contractor** shall 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 plan to the **County**.

B. The **County's** approval shall be obtained prior to the removal of any trees from the easement such concurrence shall be obtained in writing.

C. The approval of the **County** concerning the method and location of disposal of materials shall be obtained before work commences.

D. All trees that need further processing (wood chips) on-site or disposal off-site shall be processed or disposed of in conformance with Federal, State, and local rules and regulations.

E. **Contractor** shall ensure all utilities are located prior to the commencement of any clearing or construction work in the easement.

F. **Contractor** shall acquire any necessary permits prior to commencement of any type of work done in the easement especially for the removal of trees and crossing of waterways.

G. Stemmed vegetation such as brush, shrubs, and trees as necessary shall be removed at or near the ground level, leaving the root systems intact.

H. Trees shall be felled into the cleared construction area or areas to be cleared and not onto vegetation to be preserved.

I. Trees that have fallen into water bodies, or beyond the construction area, shall be removed immediately. All damage and remediation costs shall be the **Contractor's** expense.

END OF SECTION

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

D. Section 02490 - Trees, Shrubs, and Ground Cover

E. Section 02750 - Bypass Pumping

1.03 REFERENCES

A. DeKalb **County** Soil Erosion and Sedimentation Control Ordinance.

B. DeKalb **County** Comprehensive Stormwater Management and Stormwater Quality Ordinance.

C. Manual for Erosion and Sediment Control in Georgia, as published by the Georgia Soil and Water Conservation Commission (current edition).

D. Federal Clean Water Act.

E. Georgia Erosion and Sedimentation Act of 1975, as amended.

F. Georgia Department of Natural Resources, Environmental Protection Division General NPDES Permit # 100002.

1.04 QUALITY ASSURANCE

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** - **Submittals** 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**:

1. 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-fine (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

See Section 02490 – Trees, Shrubs, and Ground Cover

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

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

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

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 D698-12, Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

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 (½) 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 (¾) 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 shall be compacted to ninety-eight (98) percent of the standard Proctor maximum dry density.

3. The upper twelve-inches (12”) of fill beneath the pavement areas shall be compacted to one hundred (100) percent of the standard Proctor maximum dry density.

4. Scarification and re-compaction of the upper fill soils immediately prior to the slab-on-grade and/or pavement construction shall be required.

5. 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.

6. 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.

7. If tests indicate that density of backfill fill is less than that specified, the area shall be either be recompacted or undercut, filled, and compacted until specified density is achieved.

8. 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 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 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: Uncrushed gravel, washed, ASTM D448, Size 57.

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 Contactor shall water and maintain earth in a moist condition. The **Contractor** shall temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

D. Where utility trenches are required within 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.

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
4. Section 02535 - Gravity Flow Sanitary Sewers

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 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/ft^3 or 600 kN-m/m^3)

4. ASTM D2922 - Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

5. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method

6. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 or 2,700 kN-m/m^3)

7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

B. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D1557, except that 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 between No. 57 and No. 4, inclusive.

2.02 BEDDING AND HAUNCHING MATERIALS

A. Unless specified otherwise, bedding and haunching materials shall be crushed stone as specified below.

B. Crushed stone utilized for bedding and haunching shall meet the requirements of **Section 02060 - Crushed Stone Aggregate** and of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be No. 57.

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	

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
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, manmade 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.
http://www.dot.ga.gov/PartnerSmart/Business/Source/specs/ss600.pdf#search=section%20600 The **Contractor** shall receive direction from the **County** on which type of flowable fill shall be used on a case-by-case basis.

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 Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedures for

installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The **Contractor** shall provide closure and sealing between sheet piling and existing facilities.

F. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care 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 ensure 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 ¾-cubic-yard capacity with a bucket curling pullout capacity of 25,000 pounds.

C. Blasting: Blasting shall be performed in accordance with the requirements of **Section 02020 – Use of Explosives** and will require County approval prior to use. The **Contractor** shall exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. The **Contractor** shall provide licensed, experienced workmen to perform blasting. The **Contractor** shall conduct blasting operations in accordance with all existing ordinances and regulations and gain all required permits at their cost. The **Contractor** shall protect all buildings and structures from the effects of the blast. The **Contractor** shall repair any resulting damage. If the **Contractor** repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the **County** may direct the **Contractor** to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge at the **Contractor**'s expense.

D. Disposal of Rock: The **Contractor** shall dispose of rock, off site, that is surplus or not suitable for use as 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.

C. 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 an excavator attached compactor.

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

SECTION 02420

PRECAST POLYMER CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all materials, labor, and equipment, and construct manholes, as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit to the **County** shop drawings of the products specified herein. Shop drawings of the precast structures shall show details of construction, reinforcing, and joints.

B. Submit calculations signed by a Professional Engineer registered in the State of Georgia demonstrating the structure meets the design criteria specified herein.

1.03 INSPECTION

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the **County**.

B. At the time of inspection, the sections shall be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. Imperfections may be repaired, subject to the approval of the **County**, after demonstration by the manufacturer that strong and permanent repairs result.

1.04 MANUFACTURER

A. Manufacturer of polymer concrete structures shall have been continuously producing structures under its current name for a minimum of four (4) years. Manufacturer shall have employed current manufacturing methods and material formulation for a minimum of five (5) years. Information demonstrating these requirements shall be submitted to the **County**.

PART 2 - PRODUCTS

2.01 PRECAST POLYMER CONCRETE MANHOLES

A. Precast concrete manhole base, barrel, and top sections shall conform to Specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C478-03, and for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures, ASTM Designation C 857, except as otherwise specified below to accept polymer construction instead of concrete. Manhole risers, transition slabs, cones, base and top slabs, and grade rings shall be of the same material. The method of construction shall conform to the Drawings and the following additional requirements:

1. Barrel sections shall have tongue and groove joints. Joints shall have elastomeric gaskets conforming to ASTM C443 standard specifications.

Flexible plastic gaskets (Ram-Nek or equal) meeting Federal Specifications SS-S-210A "Sealing Compound, Preformed Plastic for Pipe Joints," Type I, Rope Form and AASHTO Designation M-198 75 1, Type B, Flexible Plastic Gasket (Bitumen) are also acceptable.

2. Materials of construction shall meet the Specifications for Polymer Concrete Pipe, ASTM Designation D 6783.
    a. Resin: The manufacturer shall use only polyester or vinyl ester resin systems designed for use with this particular application. Resin content shall be a minimum of seven (7) percent by weight.
    b. Polymer mixture: The mixture shall consist solely of thermosetting resin, sand, aggregate and quartz powder.
    c. Additives: Resin additives, such as curing agents, pigments, dyes, fillers and thixotropic agents, when used, shall not be detrimental to the structural integrity and life of the manhole.
3. Polymer concrete shall have a minimum unconfined compressive strength of 9,000 psi when measured in accordance with ASTM C 497.
4. The date and location of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
5. Top sections shall be concentric except that precast slabs shall be used where cover over the top of the pipe is less than four (4) feet for all manholes.
6. Precast slabs over top section, where required, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.
7. Connectors between manholes structures, pipes, and laterals shall conform to ASTM C923 specification for resilient connectors.
8. Holes in precast sections to receive sewer pipe shall be precast at the factory at the required locations. All precast holes shall have Kor-N-Seal (or equal) rubber boots.
9. The tops of bases shall be suitably shaped to mate with the precast barrel section.
10. All manholes with flat slab tops, except those located in paved areas or where precise adjustment of top elevation is required, shall be furnished with the cover frame cast into the top section.
11. Each manhole component shall be free of defects, including indentations, cracks, foreign inclusions, and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and service of the component.
12. Manholes shall be reinforced per ASTM C478.
13. Manholes shall have a monolithic base slab.
14. Manhole components shall have the following minimum wall thickness:
    a. Forty-eight (48) inch diameter: three (3) inches

    b. Sixty (60) inch to ninety-six (96) inch diameter: four (4) inches

    c. One hundred twenty (120) inch diameter: six (6) inches

    d. One hundred forty-four (144) inch diameter: seven (7) inches

B. Cast iron frames and covers shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. Watertight frames and covers shall be approved equal with rubber gasket and stainless-steel bolts.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Manholes and other precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications.

B. Precast structure sections shall be set so as to be vertical and with sections in true alignment with a one-quarter (1/4) inch maximum tolerance to be allowed.

C. If possible, holes in the manhole sections required for handling or other purposes shall not penetrate completely through the wall. Any penetrating lifting holes shall be permanently plugged.

D. Where holes must be field cut in the precast sections to accommodate pipes, the holes shall be cored to provide a smooth sealing surface for connecting boots. All coring shall be done prior to setting the manhole sections in place.

E. Invert Channels

1. Invert channels can be precast with polymer concrete or can be constructed in the field after the manhole and pipe have been installed. If constructed in the field, the bench and channel shall be constructed with all resin aggregate material recommended by the manhole manufacturer. Alternative fill material is prohibited.

2. Manholes shall have an invert channel shaped to correspond with the lower half of the pipe to provide smooth flow transition with no disruptions of flow at pipe-manhole connections. Provide curve transitions for side inlets and smooth pipe invert fillets for flow transitions between pipe inverts. The top of the shelf shall be sloped to drain toward the flowing through channel.

F. The shipping, handling, and installation of the manholes shall be in accordance with the manufacturer's recommendations.

G. Where adjustment or replacement of a manhole frame and cover is necessary, the following requirements shall apply:

1. Adjustment of frame and cover to grade shall be accomplished with a precast polymer concrete and/or HDPE leveling rings, fully bedded in Portland cement mortar. In no case, shall vertical adjustment exceed fourteen (14) inches.
2. The top of the frame shall be set flush with, and match the slope of, the surrounding pavement.
3. Frame shall be set in a Portland cement mortar bed (one and one half (1½) inch maximum thickness).

4. Exterior surface of rings used in leveling course area shall be coated with a Portland cement plaster one half (1/2) inch minimum thickness).
5. Adjustment or replacement of frame and covers on sewer outfall manholes shall require frame to be set on flexible plastic gasket (reference 2.01, A, 1. of this section), and anchored (along with any adjustment rings) to the manhole structure with four (4) on half (1/2) inch diameter Type 304 stainless steel threaded rods with nuts and washers. Rods shall be anchored into the existing structure using an epoxy adhesive equal to the Hilti H/T RE 500 V/V-3 System, following the manufacturer's instructions.

END OF SECTION

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 present segregation of the various seeds in a seeding mixture.

C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 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 02490

TREES, SHRUBS, AND GROUND COVERS

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes furnishing all equipment, materials, and labor necessary for soil preparation; planting of trees, shrubs, ground cover, or vines as applicable; protection, maintenance, guarantee, and replacement of plants; and all related items necessary to restore the site after the construction work is completed.

B. Products and procedures specified in this section shall apply to the following job-specific conditions:

1. Replacement of trees, shrubs, and ground covers removed or damaged as the result of construction activities. The nature and extent of replacement work shall be as indicated on the Drawings and the cost of such work shall be included in the Contract Price. Such replacement work shall include: the relocation and re-installation of existing plant materials; the replacement of removed plants with new materials, matching quantities, species and arrangement; or, a combination of these options as determined by the scope of the Work.

2. Installation of new materials in accordance with prior agreements made with property owners, as described in the Easement Stipulations. The cost of this work shall be included in the Contract Price.

3. Additional installation of new materials at the direction of the **County** shall be considered extra work and shall be paid for in the Contract.

C. Related Work Specified Elsewhere

1. Section 02200 – Earthwork

2. Section 02125 – Temporary and Permanent Erosion and Sediment Control

1.02 EXISTING CONDITIONS

A. Before commencing any work required by this Section, the **Contractor** shall ascertain the location of all utilities, subsurface drainage, irrigation systems, and underground construction so that proper precautions may be taken not to disturb or damage any subsurface improvements. The **Contractor** shall be held responsible for making, at its own expense, all repairs to damaged utilities, structures and all associated damages resulting from the work.

B. It is not contemplated that planting shall occur where the depth of soil over underground construction or obstructions is insufficient to accommodate the roots or where impervious soil will require drainage. Where such conditions are encountered in excavation of planting areas, other locations for the planting may be designated by the **County**.

C. Removal of underground obstructions, relocation of construction and provision of drainage for planting areas shall be done only as directed by the **County**.

D. If changes in the location of the work or if removal of obstructions involves additional work, the **Contractor** shall proceed in accordance with the "General Conditions" of the Contract for construction.

E. The **Contractor** shall take all necessary precautions during planting operations to avoid damage to existing sidewalks, fencing, paving, curbs, lighting, and other site improvements. Any damage that does occur shall be corrected to the **County**'s satisfaction at the **Contractor's** expense.

F. The **Contractor** shall make a dimensional sketch of existing landscaped areas before such areas are disturbed, and shall use said sketch for layout during restoration of these areas. The Preconstruction Video and any still photographs taken prior to construction activities shall also be used to verify the restoration work.

1.03 QUALITY ASSURANCE

A. All planting shall be performed by a company specializing in landscape development construction, particularly soil preparation, lawns, and live plant materials; with at least five years' experience in such work. Evidence of this experience shall be provided, citing similar projects, prior to the initiation of the work.

B. Size, quality, root ball preparation, and grading standards shall conform to the American Association of Nurserymen, Inc., as published in the "American Standard for Nursery Stock: ANSI 260.1, latest approved revision.

C. The **Contractor** shall be responsible for all certificates of inspection of plant materials that may be required by federal, state, or other authorities to accompany shipments of plants. All plants shall be inspected and approved by the **County** before they are planted. Inspection and approval of plants upon delivery shall be for quality, size, and variety only and shall not in any way impair the right of rejection for failure to meet other requirements during progress of the work.

D. Fertilizer shall conform to the local, state, and federal laws applicable to its manufacture and labeling.

1.04 PLANT GUARANTEE AND REPLACEMENT

A. Guarantee - Plants shall be alive, healthy, and vigorous at the end of the Guarantee period. The guarantee period shall be at least one year and shall terminate at the end of the first full growing season. The first full growing season begins on April 1 after planting and ends on November 1.

B. Replacement - Any plant installed under this contract that is dead or not in satisfactory growth, shall be removed from the site; these and any plants missing due to the **Contractor's** negligence shall be replaced as soon as conditions permit. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the **Contractor** shall notify the **County** immediately in writing, and the **County** shall determine acceptability. All replacement plants shall be guaranteed for the duration of one full growing season as described in Paragraph 1.05A above.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil shall be natural, fertile, agricultural soil, capable of sustaining vigorous plant growth. It shall be of uniform composition without admixture of subsoil. It shall be free of stones (½ inch in diameter or larger), clods of hard earth, live plants, roots, sticks, or other extraneous matter harmful to plant growth.

1. Topsoil shall have an acidity range of ph. 6.0 to 6.5 and shall contain not less than 6 percent organic matter.

2. Topsoil shall be obtained from naturally well drained areas that have never been stripped before.

3. Topsoil shall not be delivered in a frozen or muddy condition.

B. The commercial fertilizer shall be a complete formula, 6-12-12, and shall conform to the applicable state fertilizer laws. It shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer’s guaranteed analysis. Any fertilizer that is caked or otherwise damaged, making it unsuitable for use, shall not be accepted.

C. Pine straw mulch shall be freshly baled straw capable of producing desired results and not contain excessive amounts of pine cones, branches, or forest litter.

D. All mulch shall be clean, and free of weeds, moss, sticks, insects, and debris, and shall be satisfactory to the **County**.

E. Pre-emergent used shall be “Ronstar G” or approved equal.

F. Pine bark shall be good quality commercial stock of one-half to one (1/2” - 1") size pieces (mini-nuggets) or “Nature's Helper”.

G. Lime shall be ground limestone with analysis showing not less than eight-five (85) percent total carbonates. Lime shall be delivered in original unopened containers. Any caked or hardened lime shall not be used.

H. Water shall be supplied by the **Contractor**, along with all necessary hose or other watering equipment required for installation and maintenance of plant materials.

I. Herbicide used shall be “Round-up” or Approved Equal.

2.02 PLANT MATERIALS

A. Plant materials used will depend on job-specific conditions, as follows:

1. Trees, shrubs, and ground covers removed or damaged as the result of construction activities shall be replaced with new materials of the same size and type, except; mature trees and shrubs shall be replaced with the following minimum size requirements: trees – two (2) inch caliper; shrubs – two (2) gallon container; or,

2. Plant materials shall be of the size, type and quantity listed in the Easement Stipulations; or,

3. Plant materials will be as directed by the **County**.

B. Plant materials shall comply with State and Federal Laws relating to inspection for diseases and insect infestation.

C. Plant materials shall conform to American Standard Nursery Stock (May 2, 1989, ANSI 260.1-1986). Names shall conform to those given in Standardized Plant Names, 1942 Edition prepared by the American Joint Committee on Horticultural Nomenclature.

D. Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the plant list before pruning.

E. Plants shall be nursery grown unless otherwise specified.

F. Substitutions will be permitted only upon submittal of proof that the specified plant is not obtainable. A substitute of nearest equivalent size or variety will be used with equitable adjustment of Contract Price when approved in writing by the **County**.

G. Plants designated “B & B” in the plant list shall be adequately balled with firm natural balls of soil sized as set forth in the American Standard for Nursery Stock. Balls shall be firmly wrapped with burlap or similar bio-degradable material and bound with twine, or wire mesh. No balled plant shall be planted if the ball is cracked or broken during shipment or during the planting process.

H. Insofar as is practicable, all plant material shall be planted on the day of delivery. Plants that are to be planted immediately upon delivery shall be protected from the sun and wind. B & B plants shall be covered with moist soil, mulch, or other acceptable material. B & B plants and container grown plants shall be shaded and well watered. Plants shall not remain unplanted for longer than three days after delivery.

I. Plants shown as container grown in the plant list shall have sufficient root to hold earth intact after removal from containers but without being root-bound.

J. Caliper of tree trunks shall be measured at the chest level of a six (6) tall person for trees up to and including four (4) inch caliper size.

PART 3 - EXECUTION

3.01 TIME OF PLANTING

A. Planting operations shall be conducted immediately under favorable weather conditions in conformance to the seasonal restrictions as follows:

1. Deciduous Material: September 15 to June 15. Materials shall be in dormant condition if planted after November 1 and prior to April 1. Soil, plant material, and environmental conditions shall be suitable for planting.

2. Evergreen Materials: Spring: March 15 to June 15; Fall: September 1 to November 1.

3. Perennials: Spring: March 30 to June 30; Fall: September 1 to November

4. Annuals: In season.

5. Planting periods may be extended or reduced according to weather and soil conditions at the time. Preparations for planting may begin earlier than specified seasons, if approved.

B. At the option and on the full responsibility of the **Contractor**, planting operations may be conducted under unseasonable conditions without additional compensation; however, prior written approval shall be obtained from the **County** and the guarantee period shall remain as specified in Paragraph 1.05.A herein.

3.02 PRODUCT HANDLING AND STORAGE

A. Balled and burlapped plants shall be dug and prepared for shipment in a manner that shall not damage roots or branches.

B. Protection After Delivery - The balls or roots of plants not planted immediately upon delivery shall be covered with moist soil or mulch, or other protection from drying winds and sun. All plants shall be watered as necessary, until planted. Balled plants shall not be lifted by the trunk of the plant.

3.03 TREES AND SHRUBS

A. Locations for all plants and outlines for planting areas shall be staked on the ground and shall be approved by the **County** before plants are set. Orientation of plants, foliage, and branching shall be approved before installation. Any adjustments in locations and/or outline shall be approved in writing by the **County**.

B. Care shall be exercised to have pits dug and soil prepared prior to moving plants to pits for planting. Circular pits with vertical sides shall be excavated for all plants. Diameter of planting pits shall be twice the diameter of the ball or root spread. The depth of the pits shall be sufficient to accommodate the ball or roots when the plant is set to finished grade allowing for six inches of topsoil in the bottom of the pit. The soil at the bottom of the planting pit shall be loosened to a depth of three inches and mixed with topsoil. Any rock, rubble, hard pan, or other underground obstruction shall be removed to permit proper installation and drainage. The **Contractor** shall ensure positive drainage away from all planting beds.

C. Soil used in planting shall be a topsoil mixture. One cubic yard of pine bark “Nature's Helper” and twenty pounds of commercial six percent nitrogen – twelve percent phosphorus – twelve percent potassium (6-12-12) fertilizer or bone meal shall be mixed with every six (6) cubic yards of topsoil.

D. Unless otherwise specified, all plants shall be planted in pits, centered, and set at a depth so that the finished grade level shall be the same as that at which the plant was grown.

E. For balled and burlap material, all wire and string binding shall be removed from around the root ball. After placing the plant in the planting pit, the burlap shall be cut away or folded back from the top third of the root ball. If balled plants are wrapped with material that is not biodegradable, then this wrapping material shall be removed once the plant is set in the planting pit. Care shall be taken so not to damage the root system.

F. The pit shall be backfilled with topsoil placed in layers around the roots or ball. Each layer shall be carefully tamped to avoid air pockets. When the hole is approximately two-thirds full, water should be added. After the water has been

absorbed, the hole shall be filled with topsoil and tamped lightly to grade.

G. A four (4) inch mound of soil shall be formed around each plant to produce a saucer. On slopes, an adequate shoulder shall be formed on the downhill side to hold water and avoid erosion.

H. Guying and Staking

1. Hose shall be two-ply reinforced hose not less than three-eighths (3/8) inch inside diameter.

2. Wire shall be galvanized pliable, zinc-coated iron not less than No. 16 gage.

3. Turnbuckles shall be galvanized and have a three (3) inch minimum lengthwise opening fitted with screw eyes. Three turnbuckles are required per tree planting.

4. Trees shall be supported immediately after planting. All trees shall be guyed or staked.

5. Guy wires shall consist of two twisted strands of wire encased in hose to prevent direct contact with bark of the tree. Guying shall be spaced equally about each tree. Guy wires shall be placed around the tree trunk or lower branches in a single loop at an angle or about sixty (60) degrees or about two-fifths (2/5s) of the height of the tree. Guy wires shall be fastened to two by two by thirty (2" x 2" x 30") inch wooden stakes driven to approximately six (6) inches above the ground. Guy wires shall be tightened and kept taut by turn-buckles, or other approved methods.

6. Wood stakes to be used shall be uniform two-by-two (2" x 2") inch pressure treated wood with one end sharpened. Stakes shall be not less than six (6’) feet in length.

7. Tree species less than three (3) feet tall shall require slash staking. Wood stakes used shall be uniform two by two (2" x 2") inch pressure treated wood with one end sharpened. Stakes shall not be less than four (4) feet in length.

I. All trees shall be wrapped with standard manufactured tree wrapping paper, brown in color. Tree trunks shall be wrapped spirally overlapping two (2) inches and shall be wound from the ground line to above the lowest main branches. The wrapping shall be securely tied in at least five places, including the top, middle, and bottom, with a jute twine not less than two-ply or other approved bio-degradable material.

J. A four (4) inch layer of pine straw mulch and a pre-emergent such as “Ronstar” or equal shall be applied to all planting bed areas.

K. Plant beds containing ericaceous plants shall be top dressed with ordinary powdered sulfur at the rate of three (3) pints per one hundred (100) square feet of area.

3.04 GROUND COVERS

A. Except as otherwise specified, the **Contractor**'s work shall conform to accepted horticultural practices as used in the trade.

B. Planting areas shall be dug and soil for planting ready before plants are delivered.

C. Ground cover beds shall be prepared by thorough loosening of existing subgrade and by placement of a minimum of four (4) inches of approved topsoil to conform to the final grade. Soil used in planting shall be topsoil mixed with one cubic yard of pine bark “Nature's Helper” and twenty pounds of commercial six (6) percent nitrogen-twelve percent phosphorus – twelve percent potassium (6-12-12) fertilizer or bone meal with every six cubic yards of topsoil.

D. Pre-emergence weed control shall be applied in accordance with manufacturer's instructions.

E. All planting beds shall be mulched with a two (2) inch layer of bark mulch prior to planting. Planting holes shall be dug through the mulch. Ensure that roots are surrounded by soil below the mulch.

F. Biodegradable pots shall be crushed and non-biodegradable pots shall be removed prior to planting. The root systems of all potted plants shall be split or crumbled.

3.05 PRUNING AND REPAIR

A. Upon completion of the work under the Contract, all new trees and shrubs shall have been pruned and any injuries repaired. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs. On all bruises or scars on the bark and cuts over three-quarter (3/4) inch in diameter, the injured cambium shall be traced back to living tissue and removed; wounds shall be smoothed and shaped so as not to retain water; and the treated area shall be coated with shellac or a commercial tree wound dressing.

3.06 REUSE OF EXISTING PLANT MATERIALS

A. Where shown on the Drawings, or as allowed herein, in-situ plant materials may be removed and re-installed in lieu of replacement with new materials. Such

reuse shall conform to the following conditions:

1. In those areas indicated on the Drawings, existing trees and shrubs shall be removed and re-installed. The arrangement or location of the re-installed materials may vary from existing conditions. The **Contractor** shall be responsible for removal, proper handling, temporary storage, re-installation, and maintenance for the existing materials; however, no guarantee of survival is required. The cost of this work shall be included in the Contract Price.

2. If conditions permit, the **Contractor** may, at its own risk, remove and re-install existing trees and shrubs as an alternate to replacement with new materials. The Guarantee and Maintenance requirements shall apply for re-installed existing materials in the same manner as for new materials. The **Contractor** shall obtain written concurrence from the **County** of its intention to reuse existing plant materials prior to the execution of the work.

3. In those areas indicated in the Easement Stipulations or shown on the Drawings, certain existing trees and shrubs may be removed and re-installed by the property owner. The **Contractor** shall provide prior written notification to the property owner (with copy to the **County**) advising of the schedule of construction and the required time frame for removal. If the **Contractor** proceeds with construction without providing the required prior notice, any materials that are damaged or destroyed shall be replaced in quality and quantity at the expense of the **Contractor**.

B. Trees and shrubs shall be dug with firm natural balls of earth of sufficient size and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant.

C. All plants shall be protected from drying action of the sun and wind during digging and after being dug, while in storage awaiting planting, and while being transplanted. Heel plants or properly protect them with soil, wet peat moss or in a manner acceptable to the **County**.

D. All existing trees and shrubs shall be replanted promptly, preferably within twenty-four (24) hours after removal, but in no case longer than forty-eight (48) hours.

3.07 INSPECTION FOR ACCEPTANCE

A. Upon completion of all planting, and after receipt of written notification, inspection of the landscape work will be made by the **County**. Inspection of the work will be conducted again by the **County** during and at the end of the maintenance period.

3.08 MAINTENANCE

A. Maintenance shall begin immediately after each plant is planted and shall continue until all plants are accepted. Planting shall be protected and maintained by watering, fertilizing, and replanting as necessary, at the **Contractor's** expense, for at least one full growing season following installation beginning April 1 and ending November 1 as specified in Paragraph 1.05.A herein.

END OF SECTION

SECTION 02510

PAVEMENT REPAIRS

PART 2 - 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 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 (¼) inch for base and intermediate courses, and not more than one-eighth ($^1/_8$) 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.

    A. The **Contractor** shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

    B. 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)	½" (13 mm)
1'-11" (0.58 m)	¾" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.60 m)	1 ¼" (32 mm)
*For trench widths greater than 5' 3", the **County** will determine the plate thickness.	

2. Steel plates used for bridging shall extend a minimum of 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. An 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. An 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 RIGID PAVEMENT

A. Concrete and reinforcing bars (where required) for rigid pavement shall conform to the requirements of **Section 03200 - Concrete Reinforcement** and **Section 03300 - Cast-In-Place Concrete**. Concrete for pavement shall be Class A.

2.03 CURB AND GUTTER

A. Concrete for curb, curb and gutter, or valley gutter shall be Class A. Concrete shall conform to the requirements of **Section 03300 - Cast-In-Place Concrete**.

2.04 SIDEWALKS

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

2.05 DRIVEWAYS

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

2.06 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 white 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 recompacted to meet minimum contract compaction specifications at the expense of the **Contractor**.

B. Loose and Foreign Material:

1. The **Contractor** shall remove loose and foreign material from the surface immediately before application of paving.
2. The **Contractor** shall use power brooms or blowers, and hand brooming as required.
3. The **Contractor** shall not displace surface material.

C. Prime Coat:

1. The **Contractor** shall uniformly apply at a rate of 0.20 to 0.50 gallon per square yard over compacted and cleaned subbase surface.
2. The **Contractor** shall apply enough material to penetrate and seal, but not flood the surface.
3. The **Contractor** shall allow material to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than 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 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

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 02112 - Route Clearing
3. Section 02510 - Pavement Repair
4. Section 03200 - Concrete Reinforcement and Doweling
5. Section 03300 - Cast-In-Place Concrete

1.02 PRODUCT HANDLING

A. Protection: Use all means necessary to protect concrete materials before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the **County** at no additional cost to the **County**.

1.03 SUBMITTALS

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

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

A. Concrete reinforcement shall conform to **Section 03200 - Concrete Reinforcement and Dowelling**.

2.02 CONCRETE AND RELATED MATERIALS

A. General: Concrete and related materials including, but not necessarily limited to, joint materials, membranes and curing compounds shall conform to **Section 03300 - Cast-In-Place Concrete**.

B. Class: All concrete shall to conform to requirements of **Section 03300 – Cast-In-Place Concrete**.

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.

E. Sub-base shall be constructed of durable material such as bank-run gravel. Minimum depth of sub-base shall be three (3) inches.

F. 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.

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

SECTION 02530

SERVICE LATERAL RECONNECTION AND REPLACEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work in this section includes the reconnection of existing service laterals to the sewer main and the replacement of sewer laterals.

1.02 RELATED SECTIONS

A. Section 01510: Sanitary Sewer Main Television and Inspection (CCTV)

B. Section 02324: Trenching and Trench Backfilling

C. Section 02535: Gravity Flow Sanitary Sewers

D. Section 02537: Ductile Iron Sanitary Sewer Pipe and Fittings

E. Section 02545: Polyvinyl Chloride Sanitary Sewer Pipe

F. Section 02750: Bypass Pumping

1.03 SECTION 02600 – WASTEWATER FLOW CONTROL REFERENCES

A. ASTM A746 - 09 Standard Specification for Ductile Iron Gravity Sewer Pipe.

B. ASTM D1784 - 11 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

C. ASTM D3034 - 08 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

D. ASTM D3212 - 07(2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

E. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management, Latest Edition and Version.

1.04 SUBMITTALS

A. The **Contractor** shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The **Contractor** shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.

2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).

4. Submittals: To the **County**'s Engineer.

5. Personnel: On site by name (e.g., all labor, specialty services, etc.).

6. Accident: Report (e.g., all injuries, vehicles, etc.).

7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.

9. Visitors: On site.

10. Disposals: Type and quantity of debris (including liquids).

1.05 EXPERIENCE

A. See requirements stated in procurement documents.

B. Prior to beginning work, **Contractor** shall submit certification or documentation of the following:

1. The supervisor of the field crews shall have received proper training and have a minimum of three (3) years' experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.
2. Field crew leaders shall have received proper training in this function and have a minimum of two (2) years' experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.
3. OSHA Confined Space and Trench, Excavation Safety training for all crewmembers.

4. The **Contractor** shall provide the **County**'s Engineer with written documentation that the supervisor, crew leader/s, and all crewmembers have received the proper training and where required the requisite experience.

1.06 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. Reference Specification Section 01100 – Special Project Procedures

1.07 SAFETY

A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. All materials shall be pre-approved by the **County**.

B. The **Contractor** shall use class 50 ductile iron pipe for 6-inch service lateral connections. All laterals segments within the roadway shall be replaced with ductile iron pipe.

C. For reconnection of existing services, the **Contractor** shall select service connection pipe diameter to match existing service diameter.

D. The **Contractor** shall connect service laterals to the sewer mains with prefabricated sewer wye conforming to the specifications for the sewer main pipe material as specified in other sections of these Specifications, or other as approved by **County**'s Engineer. The use of tees is prohibited without permission from the **County**'s Engineer.

2.02 PIPE SADDLES

A. The **Contractor** shall use pipe saddles only on rehabilitated sanitary sewer mains.

B. The **Contractor** shall supply Romac Industries, Inc. Style "CB" sewer saddle, branch type universal or **County** approved equal. The **Contractor** shall use a saddle fabricated to fit the outside diameter of the pipe to which it will be attached.

2.03 CLEANOUTS

A. Class 50 ductile iron pipe and fitting shall be utilized for the installation of six- (6) inch cleanouts.

B. Rubber couplings as manufactured by Fernco, Inc. or **County** approved equal shall be utilized for pipe connection to the existing pipe.

C. Rubber doughnut gasket adapters shall be manufactured by Fernco, Inc. or **County** approved equal.

D. Non-traffic grade cleanout boxes shall comply with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management, Latest Edition and Version.

E. Traffic grade cleanout boxes shall comply with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards – latest version, DeKalb County Department of Watershed Management

PART 3 - EXECUTION

3.01 PROTECTION

A. The **Contractor** shall not allow sand, debris, or runoff to enter the sewer system. The **Contractor** shall ensure that wastewater does not backup into private property. The **Contractor** shall establish a plan to prevent sewer backups when reconnections are not accomplished in a timely manner.

B. The **Contractor** shall provide for diversion of wastewater if necessary, in accordance with the requirements of **Section 02750 – Bypass Pumping**. The **County** may direct the **Contractor** to use cleanouts to bypass wastewater from adjacent facilities if the possibility of wastewater backup is likely.

C. The **Contractor** shall be responsible for any and all damage to property due to his work.

3.02 PREPARATION

A. The **Contractor** shall provide a minimum of forty-eight- (48) hour written notice to property owners whose sanitary sewer service will potentially be interrupted.

B. The **Contractor** shall properly disconnect existing connections from the sewer and reconnect to the main line, as described in this section.

C. The **Contractor** shall reconnect service connections, including those that go to unoccupied or abandoned buildings, unless directed otherwise by the **County**'s Engineer.

D. The **Contractor** shall complete reconnection of all service lines within twenty-four- (24) hours.

3.03 RECONNECTION ON REPLACEMENT SEGMENTS

A. The **Contractor** shall install a new service wye on the new sanitary sewer main for each service connection. The service wye shall be of a material compatible with the sewer main material.

B. The **Contractor** shall remove and replace cracked, offset, or leaking service line from the center of the new sewer main up to the first fitting or five (5) feet, whichever occurs first.

C. The **Contractor** shall make up the connection between new sewer main and existing service lateral using PVC C-900 or ductile iron sewer pipe and approved fittings and couplings.

3.04 UTILITY SERVICE REPAIRS

A. Where service connections or lines from water or gas mains or sewers to the user's premises are disconnected, broken, damaged, or otherwise rendered inoperative by the **Contractor** for any reason, the **Contractor** shall, at his own expense, arrange with the respective utility company for any repairs of lines under their jurisdiction. For lines not within their jurisdiction, the **Contractor** shall repair or replace same and restore service to the premises.

3.05 SPECIAL CONSIDERATIONS

A. The **Contractor** shall notify the **County**'s Engineer of any service stub that is collapsed, has severe root intrusions, or is otherwise in poor condition. The **County**'s Engineer will make a determination on a case-by-case basis whether to proceed with the cleanout installation or replace the entire service stub. All replacement service stubs will be six- (6) inch and shall be installed in accordance with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards – latest version, DeKalb County Department of Watershed Management.

B. The **Contractor** shall notify the **County** of conflicts with other utilities, which prevent the installation of a cleanout as specified herein and make recommendations to resolve such conflicts.

C. Every effort shall be made to complete the installation and backfill excavations each day. In situations where the installation cannot be completed, the site may only be left open overnight with proper safety barriers and warning signs alerting the public to the hazard. The **Contractor** shall be responsible for providing and installing all barriers, barricades, fence, warning tape, and other items necessary to safely secure the work site.

D. Without written permission from the property owner, the spoil pile may only be placed within the easement area, right-of-way or county roadway and is not to be placed on private property. Where pedestrian or vehicular traffic is obstructed, the

Contractor shall provide adequate safety measures to protect against accident or injury.

E. Vehicles and construction equipment shall not be parked and left on private property.

F. The **Contractor** shall repair damages to sprinkler systems including those that are installed within the county right-of-way and/or sanitary sewer easement. It is recommended that the **Contractor** confer with each property owner concerning the possibility of sprinklers and the locations thereof during the notification process.

3.06 TESTING

A. The completed cleanout installation shall be televised, both externally and internally with a color CCTV camera. The same camera shall capture and record a picture of the house or street address of the installation. Without pause in recording, the **Contractor** shall pan over the restoration of property, the cleanout box, and insert the camera into the cleanout installation. The **Contractor** shall pass the camera through the cleanout, into the wye and through that portion of the six- (6) inch pipe installed. Any defects found during inspection shall be noted and corrected at no additional expense to the **County**. The **Contractor** shall make appropriate repairs until the cleanout installation passes the video inspection.

B. When directed by the **County**'s Engineer, the **Contractor** shall perform smoke testing, dye testing, or low pressure hydraulic testing to confirm reconnection.

C. All inspections shall be submitted following the standards and formats as outlined in **Section 01510 – Sanitary Sewer Main Television and Inspection (CCTV)**.

3.07 CLEANUP

A. After installation work has been completed and all testing acceptable, the **Contractor** shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the **Contractor**. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the **County**'s Engineer at no additional cost to the **County**. The work site restoration work shall be completed in accordance with the **Section 02920 – Site Restoration**.

3.08 WARRANTY

A. The **Contractor** shall guarantee his work for a warranty period of two (2) years from the date of final acceptance.

B. Within the warranty period, the **County** may inspect the work, and if repairs are needed, the repairs shall be made on a case by case basis at no cost to the **County**. For the localized repairs, the warranty period shall be one additional year.

C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02535

GRAVITY FLOW SANITARY SEWERS

PART 1 - GENERAL

1.01 SCOPE

A. The work covered under this section includes providing all labor, equipment, and materials required to furnish, install, test, and inspect gravity flow sanitary sewers as shown on the Plans and specified in this section.

B. Unless directed otherwise in writing by the **County**, the **Contractor** shall use only the pipe sizes and materials specifically designated on the Plans.

C. Related Work Specified Elsewhere:

1. Section 01210 - Measurement and Payment
2. Section 02060 - Crushed Stone Aggregate
3. Section 02200 - Earthwork
4. Section 02140 - Dewatering
5. Section 02324 - Trenching and Trench Backfill
6. Section 02537 - Ductile Iron Sanitary Sewer Pipe and Fittings
7. Section 02641 - Precast Concrete Manholes
8. Section 02650 - Testing for Acceptance of Sanitary
9. Section 02750 - Bypass Pumping
10. Section 02920 - Site Restoration
11. 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. Proposed methods, equipment, materials, and sequence of operations for sewer construction to minimize disruption of utilities and to occupied facilities on adjacent property

2. Manufacturers' instructions indicating special procedures required to install the products specified

3. Certifications that the products meet or exceed the requirements specified in these Specifications

4. Set of plans (modified to show as-built conditions)

5. Test reports

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 T180 - Standard Specification For Moisture-Density Relations of Soils Using a 4.54-kg (10-pound) Rammer and a 457-mm (180-inch) Drop

2. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe

3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft3, or 600 kN-m/m3).

5. ASTM D3034 - Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

6. ASTM D1557 - Standard Test Method for Laboratory, Compaction Characteristics of Soils Using Modified Proctor Effort 56,000 ft-lbf/ft3, or 2,700 kN-m/m3)

7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

9. American Water Works Association (AWWA), Latest Revisions

B. The **Contractor** shall provide the **County** with the product manufacturers' written certification that all products furnished comply with all applicable provisions of these Specifications. Except as may be modified herein, all materials used in the manufacture of pipe, linings, manholes, and castings shall be new, and shall be tested in accordance with the referenced standards, as applicable. The **Contractor** shall be responsible for performing and paying for sampling and testing as necessary for the certifications. The **County** shall have the right to witness testing of the materials, provided that the **Contractor's** schedule is not delayed for the convenience of the **County**.

C. The sewer pipe shall be tested and inspected at the place of manufacture for all requirements of the latest applicable ASTM standards, and certified copies of the test report covering each shipment shall be submitted to the **County** prior to laying. After delivery, pipe and fittings shall be subject to inspection by and approval of the **County**. No broken, cracked, misshaped, or otherwise damaged or unsatisfactory pipe, fittings, or damaged concrete lining shall be used.

D. Each pipe shall be clearly marked as required by the governing ASTM standard specifications to show pipe class, date of manufacture, date coated, type of coating, and manufacturer's trademark.

E. All pipe, accessories, and specials shall be new material.

F. If directed by the **County**, each pipe 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 5 days during initial pipe installation.

G. All pipes shall be subject to inspection by the **County** at the place of manufacture. The **Contractor** shall notify the **County** in writing of the manufacturing start date at least 14 days prior to the start of manufacturing. The **Contractor** shall be responsible for all inspection costs.

H. All pipes shall be inspected upon arrival. If any portion of a shipment is found to be defective in diameter or thickness, the entire shipment shall be rejected and removed from the site of the Work at no cost to the **County**. Each section of pipe shall again be thoroughly inspected immediately prior to lowering it into the trench to ensure that the interior is clean and to check for joint scratches, chipped ends, and imperfect gasket seats. Any defective pipe or

fitting discovered after the pipe is laid shall be, without additional charge to the **County**, removed and replaced with a satisfactory pipe or fitting.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. The **Contractor** shall inspect pipe materials and fittings upon arrival at the site of the Work.

B. The **Contractor** shall handle and store pipe materials and fittings to protect them from damage due to weather, impact, shock, shear, or free fall. The **Contractor** shall not drag pipe and fittings along the ground. The **Contractor** shall not roll pipe unrestrained from delivery trucks.

C. The **Contractor** shall use mechanical means to move or handle pipe. The **Contractor** shall employ acceptable clamps, rope, or slings around the outside barrel of pipe and fittings.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

A. All materials used in the construction of gravity flow sanitary sewers shall be new, unused, and of the sizes indicated on the Plans.

B. All materials shall be in strict compliance with the required standards and specifications, including those published by ASTM, ANSI, and AWWA.

C. At points of the sewer where a change in pipe classification is shown on the Plans, the **Contractor** shall begin at the next joint of pipe rather than cutting the pipe and constructing a collar unless there is a change in horizontal or vertical alignment. In the event the pipe is cut, there shall be no torch cutting; only saw cutting shall be allowed.

D. Ductile Iron Pipe and fittings shall conform to the requirements of **Section 02537 - Ductile Iron Sanitary Sewer Pipe and Fittings**.

E. Reinforced Concrete Sanitary Sewer Pipe shall conform to the requirements of approved plans and the submittal.

2.02 TRANSITION COUPLINGS

Transition joints between sewer pipes of different materials shall be accomplished by the use of **County**-standard concrete collar walls. Prior to using any other material, the **Contractor** shall submit plans to the **County** for approval.

2.03 APPURTENANCES

A. Service connections shall conform to the requirements of **Section 02537 - Ductile Iron Sanitary Sewer Pipe and Fittings**

B. Manholes shall conform to the requirements of **Section 02641 - Precast Concrete Manholes**.

2.04 CLEAN-OUTS

A. Standard Cleanout Assembly:

B. Ductile Iron (DIP) pipe for standard clean-outs shall be as indicated in the table below:

Standard Minimum Thickness Type DIP	Wall	Acceptable Manufacturers
ASTM A746	Solid Wall	Open

C. Joints for pipe and fittings shall be of the integral bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage, when tested in accordance with ANSI A21.10. Joints shall meet the requirements of ANSI A21.11. The joint system shall be subject to approval by the **County** and shall be identical for pipe and fittings.

2.05 EXCAVATION AND BACKFILL

A. Trench excavation shall meet the guidelines presented by the manufacturer to protect piping from trench loads which exceed design guidelines, Pipe backfill materials and compaction shall conform to the requirements of **Section 02200 - Earthwork** and **Section 02324 - Trenching and Trench Backfilling**.

B. Topsoil shall conform to the requirements of **Section 02920 - Site Restoration**.

PART 3 - EXECUTION

3.01 GENERAL

A. The **Contractor** shall control traffic in accordance with the requirements of **Section 01550 - Traffic Regulation**.

B. All activities shall be performed in accordance with the manufacturers' recommendations and regulations established by OSHA. Particular attention shall be paid to those safety requirements involving sheeting and shoring, working with scaffolding, and entering confined spaces.

C. The **Contractor** shall identify the locations of all existing underground utilities prior to commencing excavation activities. 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. The **Contractor** shall consult with utility companies to verify the locations of existing underground utilities.

D. In the event of damage to existing utility facilities, or uncovering damaged, broken, or disturbed utilities, the **Contractor** shall notify the agency or company owning any utility line that is damaged, broken, or disturbed. The **Contractor** shall obtain approval from the **County** and the utility owner prior to performing any temporary or permanent repairs, or any relocation of utilities.

E. The **Contractor** shall install and operate a dewatering system in accordance with the requirements of **Section 02140 - Dewatering**.

F. Where wastewater flow diversion is required for the performance of the Work, the **Contractor** shall provide wastewater flow diversion in accordance with the requirements of **Section 02750 - Bypass Pumping** and meet all Federal, State and County codes.

3.02 PIPE LAYING

A. The **Contractor** shall install the pipe in accordance with the pipe manufacturer’s recommendations and as specified in this section.

B. The **Contractor** is responsible for accurately placing pipe to the exact line and grade shown on the Plans. The control of vertical and horizontal alignments shall be accomplished by the use of a laser beam instrument. When the laser is used, the elevation and alignment of the pipe shall be checked by transit and level rod every 50 feet for smaller pipe and every joint for pipe forty-eight (48) inches and larger. Other approved methods of controlling vertical and horizontal alignments may be used if specifically authorized by the **County**. The pipe section may be adjusted by the use of "come-along" of approved design and anchorage. The practice of bumping or snatching (with backhoe or crane, etc.) used to adjust pipe after placement in

the trench, shall not be permitted. The **Contractor** shall furnish all labor and materials necessary for controlling the line and grade.

C. Each piece of pipe and special fitting shall be carefully inspected before it is placed, and no defective pipe shall be laid in the trench. Before a sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells uphill. Trench bottoms found to be unsuitable for foundations shall be undercut and brought to exact line and grade with pipe cushion, concrete cradles, and foundation backfill, or as directed by the **County**.

D. For bell and spigot pipe, bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. Bell holes shall be cut no more than five (5) joints ahead of pipe laying. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel shall rest on a solid foundation for its entire length. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets or inequalities in the flow line.

E. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. The **Contractor** shall not open up at anytime more trench than the **Contractor's** available pumping facilities are able to dewater. Movement of water that would tend to erode or affect the trench walls shall not be allowed by the **County**.

F. As the work progresses, the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.

G. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed, inspected, and approved by the **County**.

H. At times when work is not in progress, open ends of pipe and fittings shall be securely closed, to the satisfaction of the **County**, so that trench water, earth, or other substances shall not enter the pipe or fittings.

3.03 JOINT CONSTRUCTION

A. For bell and spigot pipe, the inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.

B. Rubber ring gasket joints for sewer pipe shall be installed according to the pipe manufacturer's specifications and recommendations. Extreme care shall be used in joining large-diameter pipe to avoid damaging the rubber ring or displacing it from the proper operating position.

C. Joints on ductile iron pipe sewers shall be compression joints, except where mechanical or flanged joints are called for on the Plans, and shall be installed according to the pipe manufacturers' specifications and recommendations.

D. After the joints have been completed, they shall be inspected by the **County** before they are covered. Any leaks or defects discovered at any time after completion of the Work shall be repaired immediately. Testing of gravity sewers shall be performed in accordance with the requirements of **Section 02650 - Testing for Acceptance of Sanitary Sewers**. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe that has been disturbed after jointing shall be removed, the joint shall be cleaned and remade, and the pipe shall be re-laid at the **Contractor's** expense.

3.04 WYE CONNECTIONS

A. Wye branches shall be installed in sanitary sewer lines at all points shown on the Plans or directed by the **County**. If such branches are not to be used immediately, they shall be closed with approved stoppers and shall be physically restrained.

B. All existing sanitary service lines shall be disconnected from the existing combined sewer and reconnected to the new sanitary sewer.

C. Wyes shall be installed in sanitary sewers so as to properly connect each service and to serve each vacant lot facing or abutting the street or alley in which the sewer is being laid and at such other locations as may be designated by the **County**. The exact location of each connection shall be recorded by the **Contractor** on the record drawings, utilizing conventional GPS survey, before backfilling and delivering said records to the **County**.

D. Wyes shall be standard manufactured wyes.

E. Standard manufactured tees shall only be installed with an approved submittal and directed by the **County**.

3.05 CONNECTING RISERS

A. Where shown on the Plans, included in the Special Conditions, or directed by the **County**, and where the depth of cut is over 8 feet or where the grade of a sanitary sewer is lower than necessary to drain abutting property, and at such other locations as may be designated by the **County**, connecting risers shall be installed to connect each existing house and to serve each vacant lot facing or abutting the street in which the sewer is being laid.

B. Connecting risers shall be sized in accordance with the plumbing code in effect at the time of construction but shall not be smaller in size than shown on the Plans. Risers shall be installed from a wye connection to the elevation needed to connect house services, the elevations shown on the Plans, or as directed by the **County**. The wye connection shall be installed at the location shown on the Plans, and in accordance with the Detail Drawings. Open ends of connecting risers shall be closed with approved stoppers and be physically restrained. Backfilling shall be carefully done around risers and compacted to the equivalent density of the surrounding undisturbed material.

3.06 CONNECTING EXISTING SANITARY SEWERS TO NEW SANITARY SEWERS

A. All existing separate sanitary sewers shall be connected to new separate sanitary sewers, as shown on the Plans or as directed by the **County**. Connections shall be made by constructing a manhole or utilizing an existing manhole.

B. Connection of lateral collector sewers to large-diameter trunk sewers shall be made at existing manholes or new manholes.

C. Connections to existing manholes shall be made by coring a hole in the wall of the existing manhole, installing a boot, inserting the same pipe material as the mainline being constructed, filling around same with non-shrinking grout, and troweling the inside and outside surfaces of the joint to a neat finish.

D. Connections of existing separate sanitary sewers to new separate sanitary sewers shall be plugged and shall remain plugged until final acceptance by the **County**.

3.07 TOLERANCES

Invert Elevations: The invert elevations shown on the Plans shall be for the invert at the centerline of the precast concrete manhole. Prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole, the **Contractor** shall verify the elevation of the sewer installed at the manhole. Should the elevation differ from that shown on the Plans, the **Contractor** shall take the following corrective action:

A. If the sewer is laid at negative grade, the **Contractor** shall remove and reinstall the sewer at the correct grade, at no additional cost to the **County**.

B. If the sewer is laid at a grade less than that shown on the Plans, thus reducing the sewer's capacity, the **County** may require the sewer to be removed and re-laid at the correct grade at no additional cost to the **County**.

C. If the sewer is laid at a grade greater than that shown on the Plans, and if the **Contractor** can show that there are no conflicts with upstream existing utilities or obstructions, with the **County**'s approval the **Contractor** shall adjust the grade of the next upstream manhole such that the next upstream manhole shall be set at the correct elevation. If such an adjustment, in the **County's** opinion, is substantial, the grade adjustment shall be spread over multiple sections of the sewer. If such an adjustment, in the **County**'s opinion, significantly reduces the sewer's capacity, the **County** shall require the **Contractor** to remove and relay that portion of the sewer laid at the improper grade.

3.08 PIPE PROTECTION

A. Where foundation conditions are not satisfactory, as determined by the **County**, the sewer pipe shall be protected with proper pipe protection, as shown on the Plans or as directed by the **County**.

B. The **County** may require plain concrete ditch checks on steep slopes and other locations to prevent erosion of the backfilled trench.

3.09 TESTING

All manholes shall be vacuum tested and all gravity flow sanitary sewer joints shall be pressure tested in accordance with the requirements of **Section 2650 - Testing for Acceptance of Sanitary Sewers**. Testing shall be performed in the presence of the **County**.

3.10 CLEANUP

A. After completing each section of the sewer line, the **Contractor** shall remove all debris and construction materials and equipment from the site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean, neat, and serviceable condition. The **Contractor** shall restore the site of the Work to the original or better condition in accordance with requirements of **Section 02920 - Site Restoration**.

B. Prior to requesting a final inspection, the **Contractor** shall remove and dispose of all shipping timbers, shipping bands, boxes, and other like debris brought to the site of the Work.

C. Any lawns, fences, drainage culverts, or property damaged by the sewer construction shall be repaired or replaced to equal or better condition than existing prior to commencement of the Work.

D. All shoulders, ditches, culverts, and other areas affected by the sewer construction shall be at the proper grades and smooth in appearance to provide positive drainage of the site of the Work.

E. All manhole covers shall be brought to grade, as shown on the Plans, or as directed by the **County**.

END OF SECTION

SECTION 02537

DUCTILE IRON SANITARY SEWER PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SCOPE

A. This section includes Specifications for ductile iron sanitary sewer pipe and fittings for sanitary sewer installations, as shown on the Plans and as specified in these Specifications.

B. Related Work 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 02535 - Gravity Flow Sanitary Sewers
6. Section 02650 - Testing for Acceptance of Sanitary Sewers

1.02 SUBMITTALS

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:

A. The **Contractor** shall submit for the **County's** approval, descriptive details, and shop drawings covering full details of pipe, fittings, joints and the assembly thereof, joint materials and details thereof, and full details and cuts of all castings to be incorporated into the Work.

B. The **Contractor** shall provide manufacturers' certifications that all ductile iron pipe and fittings meet the provisions of this section and meet the requirements of ANSI A21.51 (AWWA C151). Product certification shall include tensile and Charpy test results that shall be traceable to pipe numbers and testing periods. For pipe sizes thirty (30) inches and larger, hydrostatic test charts, including pipe numbers for each test cycle, shall be furnished as part of the certification test reports. Chemical analysis shall be furnished for each ladle of iron that will cover each pipe cast and shall correlate with the mechanical test results. For pipe sizes thirty (30) inches and larger, complete traceability

is required throughout the certification process. The traceability records shall be clearly legible on each pipe at the point of installation. Hydrostatic test results for any size pipe shall be furnished to the **County**.

C. The **Contractor** shall provide certifications that all pipe joints have been tested and meet the requirements of ANSI A21.11 (AWWA C151).

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 A21.10 (AWWA C110) - Ductile Iron and Gray Iron Fittings, 3-in. through 48-in., for Water and Other Liquids
3. ANSI A21.11 (AWWA C111) - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
4. ANSI A21.15 (AWWA C115) - Flanged Ductile Iron Pipe with Threaded Flanges
5. ANSI A21.50 (AWWA C150) - Thickness Design of Ductile Iron Pipe.
6. ANSI A21.51 (AWWA C151) - Ductile Iron Pipe, Centrifugally Cast for Water and Other Liquids
7. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings
8. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe
9. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials
10. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings
11. AWWA C600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances
12. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning

In addition, the **Contractor** shall submit certification from the manufacturer, sealed and stamped by a Professional Engineer Registered in the State of Georgia who is not an employee of the manufacturer, that the pipe to be supplied under this Agreement shall provide a 100-year service life if manufactured and installed in accordance with the plans and specifications for this project

1.04 MATERIAL TESTING

A. Each pipe in the size range of four (4) inches to twenty-four (24) inches shall receive a hydrostatic proof test of 500 psi for a minimum duration of 15 seconds. Each pipe in the size range of thirty (30) inches and larger shall receive a hydrostatic test not less than seventy-five (75) percent of the specified minimum yield strength for the duration of the test. Each test cycle shall be recorded on a strip chart. Each test cycle for pipe thirty (30) inches and larger shall be marked by pipe number. Each pipe shall be inspected for leaks. Pipes that contain evidence of hydrostatic leak shall be scrapped. Repair welding of hydro-leaks is not permitted.

B. Tensile test specimens shall be cut longitudinally from the midsection of the pipe wall. These specimens shall be machined and tested at least every 3 hours in accordance with the requirements of ASTM E8, and ASTM A370, where applicable; using the two-tenths (0.2%) percent offset method. Brinell hardness tests shall be performed at the same frequency as the tensile test and shall meet a maximum Brinell hardness of 230. Pipe failing to meet the minimum requirements of these standards shall be rejected. Adjacent test samples shall be made available to an independent testing laboratory upon the **County**'s request.

C. Each end of each pipe (each pipe socket and pipe spigot) shall be measured and shall conform to the standard dimensions of ANSI A21.51 (AWWA C151). In addition, each socket and spigot shall be inspected in a well-lighted area for injurious defects that could affect joint performance. Such defects may be removed by cutting off pipe ends. Pipe with injurious defects in the bell shall be scrapped.

D. The **County's** designated inspection agency shall have access to all areas of the pipe manufacturer's plant during production, inspection, and shipping, and shall have the opportunity to witness all tests associated with production and inspection of pipe and fittings for any given order. Reasonable facilities shall be provided for the **County** or the **County**'s designated inspection agency to facilitate their work while at the manufacturing facility. All production and

quality assurance records shall be made available for review upon request by the **County** or the **County's** designated inspection agency.

E. All testing work specified in this section shall be performed by the supplier. The manufacturer shall perform all tests in house as part of its quality assurance/quality control. Test results shall be submitted to the **County** in accordance with the requirements of this section.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE

A. Ductile iron pipe shall be centrifugally cast, manufactured, and tested in accordance with the requirements of ASTM A746 and furnished in minimum 18 feet to twenty (20) foot lengths unless otherwise approved by the **County**. Pipe class shall be Class 50 unless otherwise specified on the plans.

B. Joints for ductile iron pipe shall be push-on type such as Fastite Joint from American Cast Iron Company, Tyton Joint of U.S. Pipe and Foundry Company or Super Bell-Tite of Amstead Industries or approved equal unless mechanical joints are specified elsewhere in these Specifications or approved by the **County**. Joints shall be manufactured in accordance with the requirements of ANSI A21.11 (AWWA C111).

C. For ball and socket joints, the bell, ball, and retainer shall be ductile iron Grade 70-50-05, conforming to the requirements of ANSI A21.11 (AWWA C111).

D. Joints for flanged pipe shall conform to the requirements of ANSI A21.11 (AWWA C111).

E. Restrained joints shall conform to the requirements of ANSI A21.10 (AWWA C110) unless otherwise approved by the **County**.

F. Joints for "bell-less" ductile iron MT Push Pipe or GS Push Pipe shall be sealed with O-ring rubber gaskets installed in an independent internal coupling or in a machined tongue and groove type joint. Joint shall be manufactured in accordance with the requirements of ANSI A21.11 (AWWA C111) and supplied in minimum 4-foot lengths unless otherwise approved by the **County**.

G. Ductile iron pipe shown on the drawings or otherwise specified of another class other than Class 50 shall be marked by the manufacturer for ease of identification. Class 51 shall have two, two (2) inch yellow stripes; Class 53 shall have three (3), two (2) inch yellow stripes, etc.

2.02 FITTINGS

A. The **Contractor** shall use fittings of the same size and pressure rating as the pipe.

B. Unless otherwise specified elsewhere in these Specifications or approved by the **County**, mechanical joint fittings shall be used for both push-on type and mechanical joint type pipe. Ductile iron fittings for push-on pipe shall be designed for the same working pressure, laying conditions, and cover as the pipe that is used.

C. Fittings manufactured for ductile iron pipe shall conform to the requirements of ANSI A21.10 (AWWA C110); if not made in C110, then C153 shall be approved.

2.03 COATINGS

All ductile iron pipe and fittings used in open cut installations shall have a double cement-mortar lining conforming to the requirements of ANSI A21.4 (AWWA C104) and a standard bituminous outer coating. In four (4) and six (6) inch sizes used in open-cut installations, fittings may be supplied with bituminous or epoxy lining in lieu of cement-mortar, and standard bituminous outer coatings. All ductile iron pipe and fittings used in trenchless installations shall have a polyethylene lining conforming to the requirements of ASTM D1248 and a standard bituminous outer coating.

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 02539

ABANDONMENT OF EXISTING SANITARY SEWERS

PART 1 - GENERAL

1.01 SCOPE

A. The work covered under this Section includes furnishing all labor and equipment required for abandonment of existing sanitary sewers and appurtenances, as shown on the Drawings and as specified herein.

B. Related Work specified elsewhere:

1. Section 02050 - Demolition

2. Section 02125 - Temporary and Permanent Erosion and Sediment Control

3. Section 02200 - Earthwork

4. Section 02920 - Site Restoration

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and **Section 01300 - Submittals**. Prior to beginning work, the **Contractor** shall submit a schedule of demolition and detail methods to be used on each facility to be demolished.

1.03 QUALITITY ASSURANCE

Reference Standards: Comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations, and/or regulatory agency requirements, including the partial listing below:

A. CRD-C621 - U.S. Army Corps of Engineers Specification for Non-Shrink Grout

B. ASTM C150 - Standard Specification for Portland Cement

C. ASTM C33 - Standard Specification for Concrete Aggregates

PART 2 - PRODUCTS

2.01 GENERAL

A. Grout/Flowable Fill: Filling abandoned sewers shall conform to the requirements of a submittal approved by the **County**.

B. Crushed Stone Aggregate Backfill: Crushed stone aggregate backfill, as specified in **Section 02060 - Crushed Stone Aggregate**, shall be used where applicable for work described in this Section.

PART 3 - EXECUTION

3.01 INSPECTION

Abandoned sanitary sewer lines shall be inspected prior to grout filling. Where indicated on the Plans or as directed by the **County**, the **Contractor** shall perform television inspection, smoke testing, and/or dye testing to determine whether there are active service connections. The **Contractor** shall not grout fill sanitary sewer lines with active connections. Inspection costs will be included as part of the grout filling or abandoning payment.

3.02 GROUT FILL OF ABANDONED SANITARY SEWER LINES

A. Flowable fill shall be pumped into the sewer line from the upstream end with sufficient pressure to ensure that the line is completely filled.

B. When manholes are to remain in service, care shall be taken to ensure that no grout enters sewer lines or manholes that are to remain in service. If required, the interior manhole surface shall be repaired using approved methods to a smooth consistent finish.

3.03 BACKFILL OF ABANDONED SANITARY SEWER MANHOLES

A. The **Contractor** shall remove the ring and cover and the manhole corbel/cone to a minimum depth of three (3) feet. All upstream and downstream pipes are to have a brick bulkhead and sealed at the manhole.

B. The **Contractor** shall backfill abandoned manholes with approved backfill material as directed by the **County**.

3.04 REMOVAL AND BACKFILL OF EXISTING SANITARY SEWERS

A. The **Contractor** shall completely remove sewer lines where indicated on the Plans or as directed by the **County**.

B. The **Contractor** shall backfill the trench in accordance with **Section 02324 - Trenching and Backfilling**, and as directed by the **County**.

3.05 REMOVAL AND BACKFILL OF EXISTING STRUCTURES

A. The **Contractor** shall completely remove structures where indicated on the Plans or as directed by the **County**.

B. The **Contractor** shall backfill the excavation with local earth backfill unless otherwise directed by the **County**.

3.06 CLEANUP

After the abandonment or removal work has been completed, the **Contractor** shall clean up the project area. All excess material and debris not incorporated into the Work shall be disposed of by the **Contractor** in a lawful manner at the **Contractor's** cost. The site of the Work shall be left in a condition that is equal to or better than what existed prior to beginning the Work. 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

SECTION 02608

MANHOLE FRAME AND COVER INSTALLATION

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. This section includes procedures for Manhole Frame and Cover Installation.

1.02 REFERENCES

A. The following is a partial listing of reference standards that could be applicable to this specification. This should not be considered an exhaustive list. Other standards should be applied when applicable.

B. ASTM

1. A48 / A48M - Standard Specification for Gray Iron Castings.

2. A536 - Standard Specification for Ductile Iron Castings

C. Manual for Uniform Traffic Control Devices (MUTCD) standards

D. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards – latest version, DeKalb County Department of Watershed Management.

1.03 SUBMITTALS

A. Submittals shall conform **Section – 01300 Submittals**. Submit shop drawings of manhole frames and covers to the **County** for approval before installation.

1.04 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. Reference Specification Section 01100 – Special Project Procedures

1.05 SAFETY

A. All work shall be performed in accordance with OSHA standards and local, State and Federal safety regulations.

B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

1. Entry plan is also required.

PART 2 — PRODUCTS

2.01 GENERAL

A. Provide and install complete manhole covers and frames at each new sanitary sewer manhole, and in all other locations shown on the Plans or directed by the **County**.

B. Manhole covers shall be of either Standard Type or Bolt-Down Type, as indicated on the Plans or as otherwise specified. If not otherwise indicated, manhole covers shall be Standard Type.

C. The **Contractor** shall provide manhole covers and frames approved by the **County**.

2.02 MATERIALS

A. Manhole covers and frames shall be constructed of cast iron conforming to the requirements of ASTM A48 Class 30.

1. Tensile strength of the cast iron shall be a minimum of 30,000 psi.

2. Covers and frames shall be “Heavy Duty” type, rated for a minimum of H-20 loading.

B. All castings shall be sound, smooth and clean, and free of blisters, pits, cracks, and other defects.

1. Castings judged to be defective by the **County** will be rejected, and shall be replaced by the **Contractor** at no additional cost to the **County**.

2. Casting tolerances shall be ± 1/16 -inch, with an additional one-sixteenth (1/16) inch per foot of dimension.

3. Covers shall not rock or chatter” when in-place in frames

C. Manhole covers shall be cast with two (2) non-penetrating type pick-holes, located as indicated in the Detail Drawings.

1. Pick-holes shall conform to the dimensions indicated in the Detail Drawings.

2. Manhole covers shall not have vent holes.

D. The seating surfaces of frames and covers shall be machined flat to ensure contact between the cover and frame along the full perimeter.

E. Gaskets shall be provided and installed on all manhole frames.

1. Secured to the seating surface of the frame with non-degrading glue by the manufacturer.

2. Be flat, one-eight- (1/8) inch thick, black neoprene, with a tensile strength of 2,000 psi.

F. For manhole covers indicated as Bolt-Down Type, frames shall be cast and machined to accept four (4) cover bolts, on the pattern shown in the Detail Drawings.

1. Covers shall be cast with four (4) holes, three-quarter (¾) inch diameter, for the bolts on the pattern shown in the Detail Drawings.

2. Bolts shall be stainless steel hex-head cap screws, and shall be provided with all bolt-down type covers.

3. Bolts shall include stainless steel washers and rubber sealing gaskets.

G. Covers and frames shall bear the emblem of “Sewer” as illustrated in the Detail Drawings.

H. Covers and frames 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.

PART 3 — EXECUTION

3.01 PROCEDURES FOR MANHOLE FRAME AND COVER INSTALLATION

A. **Contractor** shall:

1. Prepare the manhole top cone for frame installation per manhole and manhole cover manufacturer recommendations.

2. Prepare and install manhole frames and covers per manufacturer recommendations.

3. Check the installation and condition of gaskets and replace all missing or damaged gaskets.

4. Install new frames and covers to the required elevations shown on the Plans or to the existing grade as directed by the **County**.

5. Check the manhole covers for fit in the frame.

a. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or otherwise moves in its frame, the frame and cover shall be removed and replaced by the **Contractor** at no additional cost to the **County**.

6. Install and tighten all Bolt-Down Type covers.

3.02 CLEANUP

A. After the work has been completed and all testing acceptable, the **Contractor** shall clean up the work area.

1. The work area shall be left in a condition equal to or better than prior condition.

2. Disturbed grassed areas shall be seeded or sod placed as directed by the **County** at no additional cost to the **County**.

3. The work site restoration work shall be completed in accordance with the requirements of the applicable Site Restoration sections of these Specifications.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the **Contractor**.

1. The debris and liquids are to be disposed of properly in accordance with all applicable laws.

   a. The **County** can furnish a letter to the landfill stating the **Contractor** is authorized to dispose of the non-hazardous materials.

2. Debris and liquids type and quantities are to be tracked in the daily **Contractor** diary.

3. Hauling and disposal costs will be borne by the **Contractor**.

3.03 DOCUMENTATION

A. The **Contractor** shall complete work on each asset as assigned via the **County**'s Computerized Work Order Management system.

1. Upon start of work, the **Contractor** shall receive work orders as assigned by the **County**.

2. The **Contractor** shall maintain and synchronize the status of each rehabilitation work order issued.

3.04 WARRANTY

A. The **Contractor** shall guarantee the work for a warranty period of one (1) year from the date of final acceptance.

1. If, at any time during the warranty period, any defect is identified the **Contractor** shall make repairs acceptable and at no additional cost to the **County**.

a. In this case, the **Contractor** shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02609

MANHOLE FRAME AND COVER SEALING

PART 1 — GENERAL

1.01 SECTION INCLUDES

A. This section covers the materials and methods for sealing leaking manhole frames for sanitary sewers.

1.02 SCOPE

A. Frame Sealing includes:

1. Sealing the frame joint area and the chimney above the cone of the manhole with either a manufactured or applied internal or external flexible seal.

2. Design seal to prevent leakage of water into the manhole through these areas throughout a minimum 50-year design life.

3. Installed seal shall remain flexible,

a. Allow for repeated vertical movements of the frame due to frost lift, ground movement, or other causes of not less than 2 inches

b. Repeated horizontal movement of the frame due to thermal movement of pavement or other causes of not less than ½ inch throughout the design life.

B. Manhole Cover Sealing includes:

1. Either the replacing or sealing existing manhole covers.

2. Methods described require at a minimum, the thorough cleaning of the frame rim surface by wire brushing. More aggressive cleaning methods shall be employed if either the existing conditions or the manufacturer dictate. The more stringent shall apply.

3. Detailed installation procedures shall be in accordance with the manufacturer's instructions.

1.03 REFERENCES

A. American Society of Testing Materials International (ASTM):

1. A240/A240M - 13a Standard Specification for Chromium and Chromium- Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

2. C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.

3. D412-06a - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

4. D476 - Standard Classification for Dry Pigmentary Titanium Dioxide Products.

5. D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

6. F594- Standard Specification for Stainless Steel Nuts.

1.04 SUBMITTALS

A. Submittals shall conform with **Section 1300 Submittals** of these specifications.

B. Action Submittals:

1. Manufacturer's Certificate of Compliance certifying compliance with applicable specifications and standards and that the submitted product is appropriate for the service intended.

   a. Certified copies of test reports of factory tests required by the applicable standards and this Section.

   b. Manufacturer's installation instructions and procedures and insertion runs.

2. Procedures and materials for manhole frame sealing. Product data to include;

   a. Material handling and storage,

   b. Material properties,

   c. Mixing and proportioning requirements,

   d. Maximum pot life,

e. Film/coating thickness,

f. Certification of all rehabilitation materials.

g. Recommended testing

3. Plan for capturing extraneous debris during rehabilitation process and debris disposal.

4. Safety Data Sheets (SDS).

5. Applicator's Certification Qualifications/referenced projects.

6. Approval of applicators equipment to be used for applying the product

7. Safety Plan; Confined Space Entry Plan/Permit.

a. Confined space training documentation for affected personnel

8. Field Test Report.

9. Construction Photographs.

10. Complete a daily written record (diary)

11. Confined Space Entry Plan

a. Personnel certificates of training for confined space entry

1.05 APPLICATOR'S QUALIFICATIONS

A. Applicator's Qualifications

1. Minimum 5 years' experience in application of products to be used.

a. Applicator has been trained and approved in the handling, mixing and application of the products to be used.

b. Equipment to be used for applying the product has been approved and the applicator personnel have been trained and certified for proper use of equipment.

c. Five (5) recent references of applicator (projects of similar size and scope) indicating successful application within the past 10 years.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Responsible for delivery, storage, and handling of products.

1. Store, handle products in accordance with manufacturer's written recommendations.

2. In accordance with Federal, State and Local laws and regulations.

B. Protect products from damage.

1. Damaged products shall be removed from the Site of the Work promptly.

2. Damaged products shall be replaced with undamaged products at no additional cost to the contract.

PART 2 — PRODUCTS

2.01 GENERAL

A. Products proposed for manhole frame sealing shall be approved during the submittal process prior to use on the project.

B. Obtain approval and a hydrant water meter from the DeKalb County Department of Watershed Management before operating fire hydrants.

2.02 FLEXIBLE INTERNAL RUBBER SLEEVE

A. Extensions and wedge strips shall be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C923,

1. Minimum of 1500 psi tensile strength,

2. Maximum eighteen (18) percent compression set Hardness (durometer) of forty-eight (48) ± 5.

B. Either double or triple pleated with a minimum unexpanded vertical height of eight

C. (8) inches and ten (10) inches respectively

1. Minimum thickness of 3/16 inch.

2. Top and bottom section of the flexible rubber sleeve shall contain an integrally formed expansion band recess and multiple sealing fins.

D. Top section of the extension shall have a minimum thickness of 3/32 inch and shall be shaped to fit into the bottom band recess of the flexible rubber

sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inch.

1. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the flexible rubber sleeve.

2. Any splice used to fabricate the flexible rubber sleeve and extension shall be hot vulcanized and have a strength so the sleeve can withstand a 180 degree bend with no visible separation.

3. The continuous wedge strip used to adapt the flexible rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess, and have an integral band restraint.

    a. The length of the wedge strip, when its ends are butted together, will cover the entire inside circumference of the band recess needing slope adjustment.

4. Expansion bands, studs, and nuts used to compress the sleeve against the manhole shall be integrally formed from sixteen (16) gauge stainless steel conforming to the requirements of ASTM A240, Type 304, with no welded attachments

    a. Minimum width of 1¾ inches.

    b. Minimum adjustment range of two and one half (2 1/2) diameter inches.

    c. Positive locking mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal.

    d. Band shall be permanently held in place with a positive locking mechanism which secures the band in its expanded position after tightening.

E. Flexible rubber sleeve manhole frame seal shall be manufactured by:

1. Cretex Specialty Products,

2. Sealing Systems Inc.

3. or submitted and approved “or equal” product.

a. Products substituted for use must follow the requirements found in the DeKalb County General Requirements.

b. It is the **Contractor**'s responsibility to timely submit information/tests for the **County** to make the determination of "or equal" status.

2.03 FLEXIBLE URETHANE RESIN

A. Manhole frame seal shall be used to form a flexible seal to stop inflow/infiltration and provide corrosion protection to the internal wall of a manhole from three (3) inches above the bottom of the frame to three (3) inches below the top of the cone.

1. The finished product shall conform to the minimum requirements listed below:

	Prime Coat		Final Coat	
Hardness	ASTM-D 2240	85-90	ASTM-D 2240	75
Elongation	ASTM-D 412	400%	ASTM-D 412	800%
Tensile Strength	ASTM-D 412	3200 psi	ASTM-D 412	1150 psi
Adhesive Strength	ASTM-D 903	400 lb l/in	ASTM-D 903	175 lb l/in
Tear Resistance	ASTM-D 1004	210 lb l/in	ASTM-D 1004	155 lb l/in

B. Flexible urethane resin manhole frame seal shall be Flex Seal Utility Sealant as manufacturer by Sealing Systems, Inc. or approved equal.

2.04 COVER CONVERSION AND REPLACEMENT

A. Replace frame and cover as directed by **County** in writing on a per-manhole basis.

B. Reuse the existing cover by making it watertight.

1. Accomplish by installing a gasket between the cover and the cover-bearing surface of the frame

2. Plug the vent and pick holes.

3. Make one of the plugs removable to facilitate removal of the cover.

C. Manhole cover gaskets and plugs shall be as specified in **Section 02608 – Manhole Frame and Cover**.

2.05 MANHOLE INSERT

A. The manhole insert shall be manufactured from stainless steel, Type 304, 16-gauge minimum.

1. Insert shall have

a. Factory installed handle that is a minimum of 5-feet long, 3/16-inch plastic coated stainless steel cable retaining tether that passes through a watertight grommet in the bottom of the dish

b. High-grade stainless steel adjustable locking device located between bottom of the dish and lift loop at the top end of tether.

c. Stainless steel terminal and eye and the handle shall be attached with a No. 6 high-grade stainless steel rivet.

B. Gasket shall be made of a closed-cell neoprene with pressure sensitive adhesive on one side and shall be installed by the manufacturer.

C. Insert shall have a gas relief valve designed to release at a pressure of 0.5 to 1.5 psi.

1. Material shall be Nitrile for prevention of corrosion from contact with hydrogen sulfide, diluted sulfuric acid, and other gases associated with wastewater collection systems.

PART 3 — EXECUTION

3.01 GENERAL

A. Perform all installation in accordance with the manufacturer's recommendations and in accordance with the requirements of Federal, State, and local laws and regulations.

B. Perform all tests in accordance with OSHA, Federal, State and local safety regulations prior to initiating entry in to confined space.

C. Entry into Confined Space shall only by undertaken in compliance with submitted Confined Space Entry Plan.

D. Active leaks must be corrected before the installation of any approved product.

E. Provide traffic control in accordance with the requirements of applicable State and local Georgia Department of Transportation (GDOT) requirements.

F. Manhole frames misaligned from the chimney or cone by three (3) inches or more shall be excavated and realigned.

1. Existing frames shall be thoroughly cleaned before reinstallation.

2. Realignment work shall be performed in accordance with **Section 02957 – Sanitary Sewer Manhole Rehabilitation**.

G. Loose and protruding mortar and brick interfering with the seal's performance shall be removed

1. Clean appropriate areas of the manhole frame, chimney, and/or cone/corbel by wire brushing or by more aggressive means if required by the manufacturer. The most stringent shall apply.

2. Sealing surfaces shall be reasonably smooth and circular, clean, and free of any loose material or excessive voids.

3.02 FLEXIBLE INTERNAL RUBBER SLEEVE

A. The **Contractor** shall be properly trained, certified, and licensed in the installation of frame seals by the manufacturer Have a manufacturer's recommended expansion tool and all other equipment/tools necessary to install the frame seals.

B. Field measure the manhole to determine the information required on the manufacturer's "Sizing and Ordering" procedure.

C. Contact surface for the sleeve and/or extensions shall be reasonably clean and smooth, circular and free from excessive voids or defects.

D. Detailed surface preparation, including providing a vertical surface on a cone when none exists, shall be in accordance with the frame seal manufacturer's instructions

E. The **Contractor** shall install the flexible rubber sleeve in accordance with the manufacturer's instructions.

F. After any surface preparation is completed and the rubber sleeve has been placed in the proper position, the lower band is positioned in the band recess and expanded as required to provide a watertight seal.

G. Following the expansion of the lower band:

1. Perform a QA/QC test to ensure effective sealing by pulling the upper section of the seal or extension inward to create a recess behind the seal where water can be poured.

2. Pour the water behind the seal and observe the lower sealing area for any visible leaks.

3. Consider the seal effective if no water leaks behind the seal at the lower sealing area.

4. **County** shall witness test

H. If an extension is used;

1. Place the 3/32" thick extension flap into or behind the expansion band recess to allow for the compression of both the extension flap and sleeve against the manhole surface by the expansion band.

2. Continue by placing the upper band or bands in the recess, ensuring the seal is properly placed on the manhole cone, chimney and frame and expand as required to provide an effective seal.

3. Installation procedures shall be in accordance with the manufacturer's recommended instructions.

3.03 FLEXIBLE URETHANE RESIN

A. Detailed surface preparation shall be in accordance with the frame seal manufacturer's instructions.

B. The **Contractor** shall install the flexible rubber sleeve in accordance with the manufacturer's instructions.

3.04 INSTALLATION OF MANHOLE INSERT

A. Use the existing cover in conjunction with a watertight insert installed under the cover that prevents entry of water into the manhole.

B. Manhole insert shall be designed to prevent inflow through and around manhole covers and manufactured to fit the manhole frame rim upon which the manhole cover rests.

C. Installation shall be in accordance with the insert manufacturer's instructions.

D. The manhole insert shall be fully seated upon the manhole frame rim and the cover replaced to complete the installation.

3.05 INSPECTION

A. Manhole frame seals shall be visually inspected after installation to ensure the seal is properly installed,

1. No voids or leakage points shall exist,

2. Manhole frame seal shall not detach from the manhole.

3. Any seals failing this visual test shall be reworked, as necessary, and retested at the **Contractor**'s own expense.

3.06 TESTING

A. Any seals not passing this visual inspection may, at the **Contractor** expense, be tested for leakage using a method approved by the **County**. **County** shall witness test.

B. Frame Sealing Test:

1. Manufactured frame seals shall be visually inspected to ensure

a. Sleeve is properly positioned,

b. Tight against the manhole surfaces,

c. No voids or leakage points exist under the sleeve,

d. Bands and locking nuts are tight.

2. Applied seals shall be visually inspected to ensure they have been applied according to the manufacturer's instructions.

3. Manhole frame sealing shall be randomly tested for leakage using a method approved by the **County**.

a. A minimum of 10 percent of the sealed manholes shall be tested.

b. Failing manholes shall be reworked and retested by the **Contractor** at no additional compensation.

c. If more than 5 percent of the manholes tested fail the initial test, an additional 10 percent of the sealed manholes shall be tested.

d. This process will continue until the testing is satisfactory, or until all manholes have been tested.

C. Cover Sealing Test:

1. The sealed manhole covers shall be visually inspected to ensure the bearing surface was properly cleaned, products were properly sized, installed according to the manufacturer's instructions.

2. Manholes leaking, visually unacceptable, or failing the test shall be reworked and retested.

a. **Contractor** shall be reimbursed for the cost of this additional work if an inspection by the **Contractor** and the **County** shows the work performed by the **Contractor** was not the reason for the failure of the manhole to pass the leakage test.

b. The **County** reserves the right to inspect the sealed manholes during the warranty period.

1) Any leakage or defects in the work found by this inspection shall be corrected by the **Contractor** within an agreed-upon **time at no additional cost to the County.**

3.07 CLEANUP

A. After the work has been completed and all testing acceptable, the **Contractor** shall clean up the work area.

1. Leave the work area in a condition equal to or better than prior condition.

a. Disturbed grassed areas shall be seeded or sod placed as directed by the **County** at no additional cost to the **County**.

b. The work site restoration work shall be completed in accordance with the requirements of **Section 02920 – Site Restoration**.

B. All debris and excess material not incorporated into the permanent installation shall be disposed of by the **Contractor**.

1. Debris and liquids are to be disposed of properly in accordance with all applicable laws.

2. Local municipality can furnish a letter to the landfill stating the **Contractor** is authorized to dispose of the non-hazardous materials.

3. Debris and liquids type and quantities are to be tracked in the daily contractor diary.

4. Hauling and disposal costs will be borne by the **Contractor**.

3.08 WARRANTY

A. The **Contractor** shall guarantee the work for a warranty period of one (1) year from the date of final acceptance.

1. If at any time during the warranty period, any defect is identified the **Contractor** shall make repairs acceptable to the **County** and at no additional cost to the **County**.

a. In this case, the **Contractor** shall warrant the work for one (1) year in addition to the warranty required by the Contract.

B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

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 02535 - Gravity Flow Sanitary Sewers
7. Section 02650 - Testing for Acceptance of Sanitary Sewers.
8. Section 02920 - Site Restoration
9. 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. The **Contractor** shall submit manufacturer's data and details of the following items for approval:

    a. Shop drawings of manhole sections, 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

2. Calculations: Proposed details and design calculations for stresses in precast concrete members for loading conditions including earth pressures and transportation, handling, and erection.

   a. Calculations shall be stamped by an engineer registered in the same state as the Project.

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

   The Precast concrete producer shall provide documentation demonstrating compliance with this subparagraph.

   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.

B. Design manholes in accordance with governing codes, standards and criteria specified in Section 01600, General Material and Equipment Requirements, on the Drawings and herein.

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, concentric only. Eccentric 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 not be installed in Manholes.

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. 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.

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 AND COVERS

A. 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.

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.

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 BRICK

A. Brick shall comply with the following requirements for which its use is intended. Bricks with holes through them shall not be allowed in the Work.

B. Bricks used to adjust manhole frame to grade shall conform to the requirements of ASTM C32 for grade SM. Bricks shall conform to the following dimensions, unless otherwise approved by the **County**.

	Depth (Inches)	Width (Inches)	Length (Inches)
Standard Size	2-1/4	3-3/4	8
Allowable Variation	+1/4	+1/4	+1/2

C. All brick shall be new and whole, of uniform standard size, and with substantially straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, tough and strong, free from injurious cracks and flaws, and shall have a clear ring when struck together. No soft or salmon brick shall be used in any part of the Work. Brick shall be culled after delivery, if required, and no culls shall be used except at such places, to such extent, and under such conditions as may be approved by the **County**.

2.06 CONCRETE

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

2.07 MORTAR

A. Mortar shall be prepared only in the quantities needed for immediate use. Mortar that has been mixed for more than thirty (30) minutes, or that has set, or that has been re-tempered shall not be used in the Work.

PART 2 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 concentric 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 MANHOLE TESTING

A. All manholes shall be vacuum tested in accordance with the requirements of **Section 02650 - Testing for Acceptance of Sanitary Sewers**.

3.05 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**.

3.06 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

SECTION 02650

TESTING FOR ACCEPTANCE OF SANITARY SEWERS

PART 2 - GENERAL

1.01 SCOPE

A. This section includes sanitary sewers inspection and testing methods; joint testing procedures; manhole testing methods; allowable testing limits for sanitary sewers; 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 sanitary sewers testing 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 02535 - Gravity Flow Sanitary Sewers

3. Section 02641 - Precast Concrete Manholes

1.02 SUBMITTALS

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

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.

B. American Standards for Testing and Materials International (ASTM)

1.04 GENERAL

A. Upon completion of all or a part of a sanitary sewer line installation, the **Contractor** shall test and/or inspect the sewer for acceptability. The method(s) of testing and/or inspection shall be as specified in the individual Specifications sections or the Special Conditions. Testing and inspection shall be performed in accordance with the requirements of this section.

B. One or more of the following tests and/or inspections may be required:

1. Exfiltration of water

2. Infiltration of water

3. Exfiltration of air under pressure

4. Joint testing

5. Direct visual inspection

6. Deflection testing

7. Closed Circuit Television Inspection (CCTV)

C. The testing method for individual projects shall be as specified in the Special Conditions.

D. Prior to any testing, all lines shall be cleaned of debris and flushed clean. Debris shall be caught and removed from the line and shall not be flushed into existing live sanitary sewers.

1.05 TEST SECTIONS

A. Unless otherwise specified or directed by the **County**, each section of sanitary sewer between manholes shall be tested by the air-testing method. The **Contractor** will be permitted to install a maximum of one thousand, two hundred (1,200) feet of sewer prior to performing air testing.

B. The **Contractor** may choose to divide the first section of sewer into subsections of more convenient length for testing. If the section or subsection tested does not pass the tests, it shall be repaired and the test repeated until a satisfactory test is obtained. Excavation shall not proceed beyond the first one thousand, two hundred (1,200) foot section until test results for the entire one thousand, two hundred (1,200) feet are satisfactory, or as directed by the **County**.

C. The **County** may allow alternate testing methods, or may require additional testing methods if deemed warranted.

PART 2 – PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 SANITARY SEWERS INSPECTION AND TESTING METHODS

A. All Testing Methods: All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, and securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.

B. The **Contractor** shall have cleaned and tested lines and pass all requirements before requesting final acceptance. Where any obstruction is met, the **Contractor** shall clean the sewers by means of rods, swabs, or other instruments. When requested by the **County**, the **Contractor** shall flush out lines and manholes before final inspection at the **Contractor's** cost.

C. Alignment: Pipelines shall be straight and show a uniform grade between manholes, except for curves specifically shown on the Plans. The **Contractor** shall correct any discrepancies discovered during inspection.

D. Low-Pressure Air Test: Sewer diameters less than or equal to twenty-four (24) inches:

a. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the **Contractor's** option, sewers may be tested in lengths between manholes or in short sections twenty-five (25) feet or less, using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately four (4) psi. After this pressure is reached and the pressure allowed to stabilize within approximately two (2) to five (5) minutes, the pressure may be reduced to three and one-half (3.5) psi before starting the test. If the pressure drop is equal to or less than one (1) psi during the test time, then the line will be considered as having passed the test. If the pressure drops more than one (1) psi during the test time, the line will be presumed to have failed the test, and the **Contractor** shall be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes and types is as follows:

Nominal Pipe Size, inches	Time (Min/100 feet)	
	VCP, RCP	DIP, PVC
6	0.7	5.7
8	1.2	7.6
10	1.5	9.4
12	1.8	11.3
15	2.1	14.2
18	2.4	17.0
21	3.0	19.8
24	3.6	22.8
30	*	35.4
36	*	51.2

* For pipe diameters greater than twenty-four (24) inches, check with manufacturer.

b. The **Contractor** shall provide required test equipment, including inflatable balls, braces, air hose, air source, time, rotameter as applicable, cut-off valves, pressure reducing valve, zero to fifteen (0 to 15) psi pressure gauge, zero to five (0 to 5) psi pressure gauge with gradations in one-tenth (0.1) psi and accuracy of ± two (2) percent. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.

c. The **Contractor** shall keep records of all tests made. Copies of such records shall be given to the **County**. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the **County**.

d. The **Contractor** shall observe proper safety precautions in the performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

E. Individual Joint Test: Pipe joints for sewers thirty (30) inches in diameter and larger shall be air tested individually. The joint tester assembly shall be placed over the joint and the joint area pressurized to four (4) psi. The pressure shall not drop more than two (2) psi in ten (10) seconds. The joint tester assembly shall be equal to Cherne Industries, Inc.

F. Smoke Testing: Smoke testing shall be used only to locate leaks and shall not, in any case, be considered conclusive or a substitute for air tests, exfiltration tests, or infiltration tests. In all cases, a smoke test shall be accompanied by an air test, exfiltration test, or infiltration test. The **County** may order a smoke test if another leakage test fails and the source of the leak cannot be determined by other means. Smoke testing shall only be performed where ground water is low. Smoke shall be blown into a sealed section of sewer under pressure and the **Contractor** and **County** shall observe for any smoke appearing on top of the ground indicating the presence of leaks. The **County** may require that the **Contractor** excavate the sewer to determine the source of any smoke appearing during the smoke test. All leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the **Contractor** at **Contractor's** expense in a manner acceptable to the **County**. Equipment and supplies required for smoke tests shall be furnished by the **Contractor**. The **Contractor** may choose to perform smoke tests at any time during construction; however, any such tests shall not supplant the final test of the completed Work.

G. Dye Testing: Dye testing may be used only to confirm service connection or disconnection and in no case shall be considered conclusive or a substitute for air tests, exfiltration tests, or infiltration tests. Dye testing shall only be performed where ground water is low. Dye shall be introduced into the service lateral and the **Contractor** and **County** shall observe for any dye appearing on combined or sanitary sewers. Equipment and supplies required for dye tests shall be furnished by the **Contractor**. The **Contractor** may opt to conduct dye tests at any time during construction; however, any such tests shall not supplant the final test of the completed Work.

H. Deflection Test: All PVC gravity sewers:

1. The **Contractor** shall test PVC gravity sewers for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed five (5) percent.

2. The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable manufacturing tolerances of the pipe. The mandrel shall be configured as shown on the Plans and shall have an odd number of legs, or vanes, with a quantity equal to or greater than nine (9). The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel, aluminum, or other material approved by the **County**, and shall have sufficient rigidity so the legs of the mandrel shall not deform when pulling through a pipe. The **Contractor** shall provide a proving ring for each size mandrel, with a tolerance of no more than two hundredths (0.02) inch clearance, and the mandrel dimensions shall be checked by the **County**, using this proving ring, before use by the **Contractor**.

3. The **Contractor** shall excavate and install properly any section of pipe not passing this test and re-test until results are satisfactory.

4. This test shall be performed twice:

   a. Once within the first thirty (30) days of installation, and

   b. Once during final inspection, but no sooner than thirty (30) days after pavement backfill is done, at the completion of this Contract.

5. Closed Circuit Television Inspection: The **County** shall require that the interior of a new gravity sewer be subjected to a televised inspection. Such internal inspection shall be conducted and documented in accordance with Pipeline Assessment and Certification Program (PACP) requirements. Prior to Final Acceptance the **County** shall be provided with one copy of the TV inspection report CD-ROMs, and USB 2 flash drive showing the entire length of the gravity sewer tested. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, type of joints, roundness, and distance between manholes. Any pipe found to be cracked, leaking, misaligned, bellied, or otherwise defective shall be removed and replaced.

3.02 JOINT TESTING PROCEDURES

A. Joint Testing Procedures: Each sanitary sewer joint shall be individually air tested using a packer or other approved testing device at a test pressure of four (4) psi plus one-half (½) psi per vertical foot of pipe depth up to a maximum of ten (10) psi. The packer or testing device shall be positioned within the sanitary sewer so as to straddle the joint to be tested.

The ends of the packer or testing device shall be expanded to isolate the pipe joint from the remainder of the sewer and create a void space between the

packer or testing device and the pipe joint. The air shall then be introduced into the void space until the required test pressure is recorded on the void pressure meter. If the required test pressure cannot be developed, the joint shall have failed the test. After the void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the void pressure drops by more than two (2) psi within fifteen (15) seconds, the joint shall have failed the test.

1. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation by the **County**. The void pressure data shall be transmitted electronically from the void to the monitoring equipment.

2. Prior to starting the sanitary sewer joint testing, a two (2) part control test shall be performed as follows:

    a. A demonstration test shall be performed in a test cylinder constructed in such a manner that a minimum of three (3) known leak sizes (0.062, 0.094, 0.125-inch diameter) can be simulated. During the demonstration test, the **Contractor** shall use a Test Cylinder Gauge to measure void pressure. The **Contractor** shall also install the void pressure monitoring equipment in the same manner as will be done to measure the void pressure at a sanitary sewer joint. The **Contractor** shall then apply pressure to the void space. During the demonstration test, the void pressure reading on the Test Cylinder Gauge shall be the same as that observed on the void pressure monitoring equipment at all times during the test. If the pressure reading on the Test Cylinder Gauge is not the same as the pressure reading observed on the void pressure monitoring equipment at all times, the **Contractor** shall repair or otherwise modify the packer or testing device and perform the test until the results are satisfactory to the **County**. The demonstration test may be required, by the **County**, at any other time during the joint testing Work.

    b. Upon entering each manhole to manhole section with the test equipment, but prior to the commencement of joint testing, the packer or testing device shall be positioned on a section of sound sanitary sewer between pipe joints. The **Contractor** shall then perform the test at the required pressure. If the test indicates that the sanitary sewer will not meet the joint test requirements, the **Contractor** shall inform the **County** who shall have the discretion of modifying the joint test requirements.

3. During the sanitary sewer joint testing work, the **Contractor** shall keep the following records:

    a. Manhole to manhole section tested

b. Test pressure used

c. Location (footage) of each joint tested

d. Test results for each joint tested

3.03 MANHOLE TESTING METHODS

A. All rehabilitated manholes, manhole inserts, new manholes, and replacement manholes shall be tested by the **Contractor** using the vacuum test method, following the manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after curing of linings and installation of inserts. Any leakage in the manhole or structure, before, during, or after the test shall be repaired.

B. Manholes:

1. Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed, and all pipe openings shall be temporarily plugged and properly braced.

2. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested prior to or after backfilling.

a. If tested prior to backfill, the test shall conform to ASTM C1244 as follows. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to forty (40) psi to effect a seal between the vacuum base and the manhole structure. The **Contractor** shall connect the vacuum pump to the outlet port with the valve open. A vacuum of ten (10) inches of mercury [five (5) psi] shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine (9) inches [four and one-half (4.5) psi]. The manhole shall be considered as having passed the vacuum test if the time is greater than that specified in the table below. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout. Retesting shall proceed until a satisfactory test is obtained.

b. If tested after backfill, the procedure shall be modified per NPCA guidelines (see www.precast.org).

c. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.

MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS AND DEPTHS			
Diameter (feet)	4	5	6
Depth (feet)	**Test Time (seconds)**		
8	20	28	33
10	25	33	41
12	30	39	49
14	35	48	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

C. The **County** reserves the right to have third-party consultants perform construction materials testing and assessments to any new manhole.

3.04 ALLOWABLE TESTING LIMITS FOR SANITARY SEWERS

A. Any visible or audible leaks into the sewer that can be located shall be repaired or corrected as directed by the **County**.

B. Air leakage tests shall be performed in accordance with the requirements of ASTM C828.

END OF SECTION

SECTION 02665

WATER SERVICE CONNECTION 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 service connection accessories as shown on the Plans and as specified in this section.

B. The **Contractor** shall supply all products and perform all work in accordance with applicable American Society for Testing and Material 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/service connections, 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 02200 - Earthwork
6. Section 02324 - Trenching and Trench Backfilling
7. Section 02510 - Pavement Repairs

8. Section 02521 - Concrete Sidewalks, Curbs, and Gutters

9. Section 02920 - Site Restoration

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and **Section 01300 – Submittals**. In addition, the following specific information shall be provided:

1. Complete product data and engineering data.

2. 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 B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

2. ANSI B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

3. ASTM B32 - Standard Specification for Solder Metal.

4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

5. ASTM C150 - Standard Specification for Portland Cement.

6. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.

7. AWWA C651 - Disinfecting Water Mains.

8. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning.

9. Other ANSI, ASTM, and AWWA specifications referenced herein.

1.04 TRANSPORTATION AND HANDLING

A. Unloading: The **Contractor** shall furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves, and

accessories. The **Contractor** shall make equipment available at all times for use in unloading. The **Contractor** shall not drop or dump materials. 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.

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/service connection 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 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**.

2.02 PIPING APPURTENANCES

A. Tapping Saddles: Tapping saddles are not allowed unless approved by the **County**

B. 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.

2.03 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 pipelines 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. 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 - Temporary and Permanent Erosion and Sediment Control**.

C. 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.

D. 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.

E. Maintaining Highways, Streets, Roadways, and Driveways: 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 LAYING AND JOINTING PIPE AND ACCESSORIES

A. The **Contractor** shall lay all pipe and fittings to accurately conform to the lines and grades established required of the Contract Documents.

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. 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.

3. 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.

4. 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..

5. 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.

6. 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.

3.04 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 pipeline.

F. Connections Using Couplings: Where connections are shown on the Plans using couplings, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging, and backfill.

G. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. 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.

3.05 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.

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.

3.06 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** designated 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.

3.07 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 - Pavement Repairs** and **02521 - Concrete Sidewalks, Curbs, and Gutters**. Restoration of off-street areas shall comply with the requirements of **Section 02920 - Site Restoration** 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.

END OF SECTION

SECTION 02711

FENCING AND GATES

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals required for a complete installation of chain link fence and gates. All materials shall be installed and adjusted, in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

B. Contract drawings show only functional features and some of the required external connections. They do not show all components required for a complete installation nor exact dimensions particular to any manufacturer's products. **Contractor** shall supply all parts, devices, and equipment necessary to meet the requirements of the Contract Documents and shall make all dimensional adjustments particular to the materials being furnished. All costs associated with such changes and adjustments shall be considered as being included in the price bid for the Work shown and specified.

C. Related Work specified elsewhere:

Section 03300 – Cast-in-Place Concrete

1.02 SUBMITTALS

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

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:

1. Department of Transportation Standard Specifications for Construction of Roads and Bridges, Sections 643 and 894.

2. DeKalb Department of Watershed Management Standards

B. Experience: Products furnished under this Section shall be of a design and manufacture that has been successfully used in similar applications. The manufacturer shall have furnished product for a minimum of five similar applications. Provide a list of such installations complete with installation description contact names, addresses, telephone numbers. This reference list shall be submitted with the shop drawings.

1.04 QUALITY STANDARDS

A. The chain link fence and gates shall be furnished by a single manufacturer who shall assume sole responsibility for providing a complete system designed for long life with a minimum of required maintenance meeting the requirements specified herein and as shown on the Drawings.

B. Manufacturer shall provide written certification that the material provided under this Specification has been amply designed and is a suitable application for these service conditions.

C. Manufacturer's offering products that comply with these specifications include:

Anchor Fence, Inc. or Approved equal.

1.05 WARRANTY

A. Provide a warranty against defective materials and workmanship in accordance with the requirements of the General Requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL

A. Fence Fabric and Posts/Rails to be Galvanized

B. Fence Fabric to be 2'' mesh, 9 gage

C. All Welded Construction

D. Height 96-inches

E. Bottom Lock slats, HDPE. County to choose color.

2.02 POSTS AND RAILS

A. Line Posts shall be: Nominal two and one-half (2 1/2) inches outside diameter Sch 40 galvanized steel pipe minimum weight three and sixty-five hundredths (3.65) pounds per linear foot.

B. End, Corner, and Pull Posts: Four (4) inches outside diameter Sch 40 galvanized, weighing a minimum of 9.10 pounds per linear foot.

C. Rails shall be furnished in lengths of not less than 21 feet. One and five-eighths (1-5/8) inch outside diameter galvanized Sch 40 steel pipe, minimum weight of two and twenty-seven hundredths (2.27) pounds per linear foot.

D. Posts shall be fitted with tops designed to fit securely over the posts and carry

the top rail. The tops and fittings shall be of dimensions shown on the Drawings.

2.03 GATES

A. Frames, Posts, hinges, and fitting shall be in accordance with dimensions shown on the Drawings. Slide gate shall be compatible to accept automatic slide gate operator.

B. Slide Gate operator to be LiftMaster Elite Series SL 585 sized for size and weight of gate.

2.04 BARBED WIRE

A. Galvanized steel barb wire shall be composed of two strands of No. 12 1/2 gauge wire with round barbs, four-point pattern, spaced five plus and minus one-half (5±1/2) inch apart conforming to ASTM: A 121, Class 2, or at the **Contractor**'s option may be high tensile strength barbed wire. If the **Contractor** elects to furnish high tensile strength bared wire, it shall meet the requirements of ASTM: A 121 with the following exceptions:

1. The coated line wires shall have a nominal diameter of 0.067 inch. The coated barbwires shall have a nominal diameter of 0.057 inch.

2. The minimum weight of zinc coating shall be seventy-five hundredths (0.75) ounces per square foot for the line wire and seventy hundredths (0.70) ounces per square foot for the barbed wire.

3. The line wire shall have a minimum tensile strength of four hundred seventy-five (475) pounds per individual strand.

2.05 GROUND RODS

A. Ground Rods shall be five-eighths (5/8) inch in diameter but no less than nine-sixteenths (9/16) inch and shall be minimum eight (8) feet in length unless otherwise shown on the Plans. Ground rods shall be galvanized steel. Galvanizing shall have a minimum coating of two (2) ounces per square foot in accordance with the requirements of ASTM: A 153.

PART 3 - EXECUTION:

3.01 GENERAL

A. Fence shall normally be constructed within the right-of-way line with no portion of the permanent installation encroaching on adjacent property. When it is necessary for the **Contractor** to trespass on private property outside of the right-of-way or easements provided on the Drawings, the **Contractor** shall obtain permission from the property owner for such intrusion.

B. Fence shall generally follow the contour of the ground, with the bottom of

fence fabric no less than one inch or more than six inches from the ground surface. The fence line shall be cleared a maximum of eight (8) feet wide and minor grading shall be performed where necessary to provide a neat appearance. Where abrupt changes in the ground profile in low areas make it impractical to maintain the specified ground clearance, longer posts may be used and multiple strands of barbed wire stretched thereon with vertical clearances between strands of barbed wire six (6) inches or less.

C. Any of the various types of fencing materials shown in Part 2, may be used, except that posts, fabric, barbed wire, and appurtenances, including gates when required, shall be of the same or matching type for each Project, unless otherwise directed.

3.02 INSTALLATION

A. Posts shall be located and installed as called for on the Drawings. "C" and two and three-eighths (2 3/8) inch tube-type line posts for all types of fences shall be installed using concrete encasement. Posts installed in rock shall be in accordance with Article 643.03.B.3 of the DOT Standard Specifications.

1. All corner, end, and pull posts shall have concrete encasement as shown in the Drawings. Posts damaged by driving shall be replaced by the **Contractor** at its expense. When posts are set in concrete, the entire hole around the post shall be filled with Class A or B concrete. Concrete may be hand mixed for batches of one-half (1/2) cubic yard or less. The posts shall be firmly braced and held in place until the concrete has set. Distance between end, pull, and corner or angle post assemblies, shall not exceed the following:

   For Chain Link Fence, Straight Line: five hundred (500) feet

   For Chain Link Fence, Curved Line: two hundred fifty (250) feet

2. Posts placed on concrete walls, slabs or solid rock shall be set in round holes twelve (12) inches deep or as indicated on the Drawings. The space around the post shall be filled with a cement filler approved by the **County**.

3. Posts shall be repaired after cutting or drilling. Galvanized steel posts shall be repaired in accordance with the manufacturer's recommendations.

4. Fence Erection; Fence fabric or barbed wire, except when posts are set in concrete footings, may be installed when posts are set and braced. When posts are set in concrete footings, the installation of fabric or wire shall be delayed to allow the concrete to cure at least five (5) days. When barbed wire fence is required, three strands shall be installed unless otherwise indicated on the Drawings.

B. Gates: Gate assemblies shall be of the length, height and type designated on the Drawings, and installed so as to provide for two hundred seventy (270) degree swing. Gate frames shall be welded units and shall be properly coated after welding. Fabric matching the fence fabric shall be stretched taut over the gate frame. Gate assemblies shall be provided with a positive type locking device, padlock, and keys.

C. Electrical Ground: Whenever a power line carrying more than six hundred (600) volts passes over the fence, a ground rod shall be installed. The ground rod shall be installed at the nearest point directly below the point of crossing. Where possible the ground rod shall be driven into the ground for a full eight (8) feet of penetration. In rocky soil, the rod may be driven slanted, so as to provide eighteen (18) inches of cover at the tip. If solid rock is encountered, two (2) ground rods may be installed at the nearest post on each side of the power line crossing where soil conditions will permit. A length of No. 6 bare copper seven (7) stranded wire shall be attached between the fence and the ground rod with suitable clamps.

3.03 STORAGE OF MATERIALS

A. Barbed wire, wire fence fabric, steel posts, hardware, and other materials, shall not be stored in contact with the ground but shall be placed in floored buildings, on platforms, or on wooden timbers or poles. Floors, platforms, or props shall be high enough to prevent the wire and steel posts from having any contact with the groundwater or surface water. Wire or steel posts that are damaged due to improper storage at any time between fabrication and final erection shall be rejected. Except when rusting occurs as a result of ponding water after erection of the fence, all wire or posts that show signs of rusting before final acceptance shall be repaired, as directed by the **County**, or removed and replaced with new material at the **Contractor**'s expense.

END OF SECTION

SECTION 02750

BYPASS PUMPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Work described in this Section includes furnishing all materials, labor, equipment, and incidentals required to install, test, and maintain a temporary bypass pumping system for the purpose of diverting all wastewater flows around the Work area.

B. The objectives of flow bypass and/or diversion pumping are to:

1. Maintain an efficient and uninterrupted level of service to wastewater collection system users while replacement, cleaning or internal condition assessment operations are facilitated on the segment or segments being bypassed and/or from which flow is being diverted, within the wastewater collection system

2. Ensure all levels of wastewater flow are continuously and effectively handled around the segment or segments of sewer being bypassed and/or from which flow is being diverted by:

   a. Providing odor control measures and systems to contain and control odors at the intake and discharge manholes or other locations

   b. Ensuring that bypass and diversion pumps are adequately fueled, lubricated, and maintained

   c. Ensuring that backup spare parts are expeditiously installed in the flow bypass and/or diversion pumping system in the event of component breakdown

   d. Ensuring an emergency response plan is smoothly implemented in the event of system failure

   e. Preventing backup, spillage, flooding or overflow onto streets, yards and unpaved areas or into buildings, adjacent ditches, storm drains, and waterways, while flow bypass or diversion pumping takes place and ensuring that installation, startup and subsequent disassembly of the flow bypass and diversion pumping system is smoothly transitioned

C. At all times during pumping operations, an experienced bypass/diversion pump maintenance operator/mechanic and/or assistant shall continuously be on site to monitor the operation of the entire bypass/diversion system. The operator/mechanic and/or assistant shall comprehensively and continuously:

1. Adjust pump speed as appropriate so as not to adversely impact upstream or downstream flow condition levels.

2. Check that the bulkheads, dams, diaphragms, plugs, valves, weirs, and all other flow control devices are working effectively and according to plan.

3. Check the integrity of hoses and couplings along the entire bypass / diversion system.

4. Monitor fuel tanks and refuel as necessary.

5. Monitor lubrication levels and provide additional lubrication as necessary.

6. Facilitate minor repairs as required.

7. Report to the **County** on potential problems.

8. Inspect bypass-pumping system at least hourly to ensure that the system is working correctly.

9. Maintain adequate supply of spare parts on site as required.

10. Monitor and maintain odor control facilities and systems.

D. Bypass pumping systems shall include a minimum of one thousand (1,000) lineal feet discharge piping length.

E. Related Work Specified Elsewhere

1. Section 01010 - Project Procedures

2. Section 02920 - Site Restoration

1.02 UNIT RESPONSIBILITY

A. Bypass pumps, piping, and associated accessories shall be provided by a single supplier to ensure a completely integrated and functional system and temporary HDPE piping systems shall be tested for leakage prior to use.

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.**

B. The design, installation, and operation of the temporary pumping system shall be the **Contractor**'s responsibility. The **Contractor** shall employ the services of a vendor that can demonstrate to the **County** that the vendor specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least three (3) references of projects of a similar size and complexity as this Project, successfully performed by the vendor's firm within the past three years. Each reference shall include the name of the agency, the name of the project, the date of the project, and the agency contact (telephone, fax, and e-mail). The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

C. During the course of the project, the detailed, Work-Specific Bypass Pumping/Flow Diversion Plan for any bypass utilizing multiple pumps, or a single pump greater than or equal to a four (4) inch discharge, shall be submitted to the **County** at least ten (10) days before required. The plan shall outline all provisions and precautions, to be taken by the **Contractor**, regarding the handling of existing wastewater flows and control of odors. The plan shall be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary and/or required to ensure proper protection of the facilities and control of odors. The Plan shall also include details of protection of the access and bypass pumping locations from damage due to the discharge flows, compliance with the requirements, and permit conditions specified in these Contract Documents. No Work shall begin until all provisions and requirements have been reviewed and authorized by the **County**.

D. The **Contractor** shall submit two (2) copies of the Flow Bypass Pumping/Flow Diversion Plan, described in Item 1.03(C), for each sewer bypass set up with sufficient detail to show:

1. Staging areas for pumps

2. Sewer plugging method and types of plugs

3. Number, size, material, location, and method of installation of suction piping including manhole cone removal and reconstruction

4. By-pass pump sizing criteria (i.e., force main size and length, static and dynamic head, flow velocity, maximum wastewater level depths in manholes upstream of bypass pump operations), and resulting capacity, number of each size to be on site, and power/fuel requirements

5. Calculations for selection of bypass pump size and pump curves showing the pump operating range

6. Standby power generator size, location

7. Downstream discharge plan

8. Method of protecting discharge manholes or structures from erosion and damage, including manhole cone removal and reconstruction

9. Thrust and restraint block sizes and locations

10. Sections showing suction and discharge pipe depth, embedment, select fill, and special backfill where required

11. Method of noise control for each pump and/or generator

12. Any temporary pipe supports, including rollers and elevated rollers, as well as anchoring required

13. Design plans and computation for access to bypass pumping locations indicated on the drawings

14. Schedule for installation of and maintenance of bypass pumping lines

15. Plan indicating selected location of bypass pumping lines

16. Plan indicating the means by which flows from service laterals shall be accommodated

17. Plan for maintaining traffic access to private property and public streets

E. All proposed flow control arrangements, including flow bypass and/or diversion pumping plans for sewers, shall also include an emergency response plan to be followed in the event of a failure of the bypass pumping and/or diversion system.

F. The **Contractor** shall notify the **County** twenty-four (24) hours prior to commencing actual flow bypass and/or diversion pumping operations. The **Contractor**'s Bypass Pumping/Flow Diversion Plan and Emergency Response Plan shall be agreed to by the **County** before the **Contractor** is allowed to commence wastewater bypass pumping and/or diversion.

1.04 ENVIRONMENTAL PROTECTION

A. The **Contractor** shall take necessary precautions to ensure that bypass operations do not result in wastewater overflows, sewer backups, odors, or related threats to the public health and do not cause flooding or damage to public or private property.

B. The pumped wastewater shall be in an enclosed hose or pipe that is adequately protected from traffic and shall be redirected to the sanitary sewer system. The dumping or free flow of wastewater on public and private property, gutters, streets, sidewalks, or into storm drains is prohibited. Open channels or trenches shall not be used to convey wastewater flow.

C. Should any liquid or solid matter from the wastewater collection system be spilled, discharged, leaked, or otherwise deposited to the environment, the **Contractor** shall immediately notify the **County,** clean, and disinfect the affected area to meet minimum state and local standards. In addition, due care and attention shall be provided to prevent the leakage of pump fuel or lubrication oil.

D. Any wastewater overflows, backups, leaks, odors, or property damage resulting from improper setup or failure of the bypass pumping system shall be the responsibility of the **Contractor**. The **Contractor** shall be responsible for any fines, for the complete clean-up of such spills, and for all restoration of any damaged property at no additional cost to the **County**.

PART 2 - PRODUCTS

2.01 BYPASS PUMPS

A. The bypass pumps used shall be fully automatic, self-priming units. The pumps shall possess dry-running capabilities to accommodate the diurnal, cyclic nature of wastewater flow.

B. Bypass pumps shall be of sufficient capacity to accommodate the daily peak sanitary sewer flows plus any additional flows due to rain events.

C. The bypass pumps shall be driven by either electric motor or diesel engine.

1. Diesel engines shall be provided with acoustic enclosures to minimize noise.

2. The **Contractor** is responsible for providing all necessary and required power and control wiring and associated electrical devices when using electric motors.

D. Unless otherwise specified or approved by the **County**, the pumping equipment shall be sound attenuated; noise levels shall not exceed seventy-five (75) decibels at twenty-three (23) feet.

E. The **Contractor** shall also provide a backup, onsite, bypass pumping system that shall automatically energize upon a high-water level, indicating the failure of the primary bypass pumping unit. The backup system shall be equal in all respects to the primary system.

F. The Bypass Pumping system shall be equipped with an electronic remote monitoring device that will notify the Contractor and the pump operator in the

event of a high-water level condition or a malfunction or failure of the bypass pumping system.

G. The bypass pump equipment supplier shall provide technical support and service twenty-four (24) hours/day, seven (7) days/week.

2.02 SYSTEM DESCRIPTION

A. Design Requirements:

1. Bypass pumping systems shall have sufficient capacity to pump a peak flow in the pipes that are being replaced, cleaned, or inspected. The **Contractor** shall provide all pipeline plugs, pumps of adequate size to handle wet weather peak flows, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be replaced, cleaned, or inspected. The bypass pumping system shall be designed to be operated twenty-four (24) hours per day.

2. The **Contractor** shall have adequate standby equipment available and be ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.

3. The **Contractor** shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System shall overcome any existing force main pressure on discharge if applicable.

B. Performance Requirements:

1. To prevent interruption in the flow of wastewater, the **Contractor** shall, throughout the duration of the project, provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), piping, conduits, all necessary power, and all other labor and equipment necessary to intercept the wastewater flow before it reaches the point where it would interfere with its work, carry it past its work, and return it to the existing sewer downstream of its Work.

2. The **Contractor** shall meet the requirements of all codes and regulatory agencies having jurisdiction over the design, installation, and operation of the temporary pumping system. The bypass systems shall be the **Contractor**'s responsibility.

3. The **Contractor** shall provide all necessary means to safely convey the wastewater past the Work area. The **Contractor** shall not be permitted to stop or impede the main flows under any circumstances.

4. The **Contractor** shall maintain wastewater flow around the Work area in a manner that will not cause surcharging of or damage to sewers and that shall protect public and private property from damage and flooding.

5. The **Contractor** shall protect water resources, wetlands and other natural resources.

PART 3 - EXECUTION

3.01 PLANNING

A. The **Contractor** shall be solely responsible for planning and executing wastewater flow control, bypass, and diversion pumping operations. The **Contractor** shall be entirely liable for damages to private or public property that may result from its operations and for all cleanup, disinfection, damages, and resultant fines in the event of a spillage, flooding or overflow.

B. The Contractor shall coordinate the bypass pump installation and start-up with the County.

1. A minimum of forty-eight (48) hours advance written notice shall be given before starting bypass operations. The bypass pumping system shall be tested for a minimum of twenty-four (24) hours without incident prior to taking any part of the collection system, including pump stations, out of service. Should any incident occur, the test period shall be restarted. Bypass operations shall not start or restart on Fridays.

2. The **County** reserves the right to delay the start of bypass operations (e.g., in the event of forecasted adverse weather).

3.02 GENERAL

A. Precautions:

1. The **Contractor** is responsible for locating any existing utilities in the area the **Contractor** selects to locate the bypass pipelines. The **Contractor** shall locate the bypass pipelines to minimize any disturbances to existing utilities and shall obtain approval of the pipeline locations from the **County**. Costs associated with relocating utilities and obtaining approvals shall be paid by the **Contractor**.

2. During all bypass pumping operations, the **Contractor** shall protect sewer lines and manholes from damage caused by any equipment. The **Contractor** shall be responsible for all physical damage caused by its activities.

3.03 PLUGGING OR BLOCKING

A. The **Contractor** shall insert sewer line plug into the line at a manhole upstream from the manhole or sewer that is to be cleaned or inspected. Flow-through plugs shall be used in the manhole or sewer that is to be

cleaned or inspected where possible to save on discharge piping and the environment.

B. Plugging or blocking of wastewater flows shall incorporate primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance or work, it is to be removed in a manner that permits the wastewater flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

3.04 FLOW BYPASS AND/OR DIVERSION PUMPING SCHEDULING

A. If the **County** is operating or maintaining conventional pumping facilities and/or flow bypass and/or diversion pumping in the construction area of the present Contract, the **Contractor** shall coordinate with the **County** as necessary to determine and effect optimum working arrangements.

B. The **Contractor** shall immediately cease bypass and/or diversion pumping when so ordered by the **County**.

3.05 PIPE RESIDUE

A. When flow bypass and diversion pumping operations are complete, the residual contents of wastewater in piping shall be drained into the existing sewer prior to disassembly.

END OF SECTION

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
6. Section 02535 - Gravity Flow Sanitary Sewers

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. 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

1. 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.

   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.

A. 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.

B. 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.

C. 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.

D. **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 ± 3.0 percent.

2. Percent organic matter: Nine and two-tenths (9.2%) percent ± 0.8 percent.

3. Percent ash content: One and eight-hundredths (1.08%) percent ± 0.2 percent.

4. pH: four and eight tenths (4.8) (± 0.5).

5. Water holding capacity: one thousand one hundred fifty (1150) grams water/ one hundred (100) grams fiber minimum.

E. **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, over seeded, or grassed shall be prepared by plowing, disking, and harrowing to a depth or not less than six (6) inches. After plowing, topsoil shall be spread on the prepared area to a depth of four (4) inches and smoothed to a uniform depth. The finished surfaces shall present a smooth, uniform, loose, well broken soil. All large clods, boulders, stumps, large roots, roots, debris, and other particles two (2) inches in diameter or greater and which will interfere with the Work shall be removed from the site of the Work.

B. Lime shall be uniformly spread over the area to be planted or sowed at the rate of 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, inspect 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 re-inspected 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

SECTION 03200

CONCRETE REINFORCING

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 A615 / A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

2. ASTM A1064 / A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

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 R - PRODUCTS

2.01 REINFORCING MATERIALS

A. Bar Reinforcement: ASTM A615, Grade 60, deformed billet bars.

1. Recycled content shall be a minimum of 75 percent recycled post-consumer steel.

B. Welded Wire Fabric: ASTM A1064.

2.02 ACCESSORIES

A. Tie Wire: Minimum 16-gage black annealed wire.

B. Bar Supports:

1. At surfaces exposed and 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.

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.

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 IBC Chapter 17.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 — GENERAL

1.01 GENERAL

A. Cast-in-place concrete work shall meet ACI 301-16. The requirements herein are in addition to ACI 301. Where documents are in conflict, the more stringent requirement shall apply.

1.02 SECTION INCLUDES

B. 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.

1.03 RELATED SECTIONS

A. Section 02510: Pavement Repairs

B. Section 02521: Concrete Curbs, Gutters, and Sidewalks

1.04 REFERENCES

A. ACI 301 – “Specification for Structural Concrete”

B. ASTM C33 – “Standard Specification for Concrete Aggregates”

C. ASTM C494 – “Standard Specification for Chemical Admixtures for Concrete”

1.05 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

J. Waterstop manufacturer's written instructions for product shipment, storage, handling, installation/application, splicing and repair.

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:**

1. Class “A”: 4,000 psi minimum compressive strength at twenty-eight (28) days. Applies to all elements, unless otherwise specified. Applies to all structural elements.

    a. Exposure Class: F1, S1, W1 (P1), C1 in accordance with ACI 301.

2. Class “B”: 3,000 psi minimum compressive strength at twenty-eight (28) days. Applies to civil site work (excluding pavement) only where specified.

    a. Exposure Class: F0, S0, W0 (P0), C0 in accordance with ACI 301.

2.03 HYDROPHILIC RUBBER WATERSTOPS

A. For use at construction joints only, where new concrete is placed against existing or precast concrete and as shown on Drawings.

B. Material shall be a nonbentonite hydrophilic rubber compound.

C. Available products subject to compliance with requirements that may be incorporated in the Work include the following:

1. Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ 1020 2K with Leakmaster LV 1 adhesive and sealant.

2. Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC 2010M with 3M 2141 adhesive and P 201 sealant.

PART 3 - EXECUTION

3.01 WATERSTOP INSTALLATION

A. Continuous waterstop (as specified) shall be installed in all construction joints as shown on Drawings.

B. Join waterstop at intersections to provide continuous seal.

C. Do not displace waterstop during concrete placement.

D. Repair or replace damaged waterstop.

E. Place concrete and vibrate to obtain impervious concrete in vicinity of joints.

F. Install in accordance with manufacturer’s written instructions.

G. Provide minimum of 4 inches of concrete cover over waterstop. When structure has two layers of steel reinforcement, locate centered between layers of steel or as shown.

H. Apply adhesive to concrete surface and allow to dry for specified time before applying waterstop strip.

I. Lap ends of waterstop strip together at splices and corners and join with sealant.

J. Verify that waterstop is anchored firmly in place before placing concrete. Do not allow vibrator to come into contact with waterstop.

3.02 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 50º F and a maximum of 90º 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.

3.03 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 40º 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.

3.04 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.

3.05 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

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide all miscellaneous metal work as indicated, specified or as needed to provide a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. All materials in this Section are to be manufactured in the United States.

1.03 SUBMITTALS

A. Product data: Within 30 calendar days after the **Contractor** has received **County**'s Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

B. Shop drawings shall show size of components, materials of construction, connection to other components and anchorage.

C. Samples shall be submitted at the **County**'s request.

1.04 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.01 GENERAL

A. Finished and machined faces shall be true to line and level.

B. Welding shall conform to applicable requirements of:

1. Steel products: American Welding Society Standard D1.0-63.
2. Aluminum alloy products: Recommended practices as published in "Welding Aluminum" by the American Welding Society.

C. Unless otherwise specified, materials shall conform to the following:

Structural Steel	ASTM A 36
Welded and Seamless Steel Pipe	ASTM A 53
Gray Iron Castings	ASTM A 48, Class 30
Galvanizing, General	ASTM A 123
Galvanizing, Hardware	ASTM A 153
Galvanizing, Assemblies	ASTM A 386
Aluminum (Extruded Shapes)	6063 T5 (Alum alloy)
Aluminum (Extruded Pipe)	6063 T6 (Alum alloy)
Aluminum Bars and Shapes (Structural)	6061 T6 (Alum alloy)
Bolts and Nuts	ASTM A 307
Stainless Steel Bolts, Fasteners	AISI Type 304
Stainless Steel Bolts, Anchor Bolts	AISI Type 316
Stainless Steel Plate and Sheet, Wire	AISI Type 316
Welding Rods for Steel	AWS Spec for Arc Welding

D. Workmanship and finish shall be equal to the best practices of modern shops for the respective work.

1. Exposed surfaces shall have smooth finish and sharp, well defined lines and arises.
2. Sections shall be well formed to shape and size with sharp lines and angles.
3. Curved work shall be sprung evenly to curves.

4. Metal work shall be countersunk properly to receive hardware and provided with the proper bevels and clearance.
5. Cutting shall be done by shearing, sawing or flame cutting; if flame cut, the metal shall be ground back to smooth sound material.
6. Holes for bolts and screws shall be drilled.
7. Conceal fastenings where practicable.

2.02 STEEL AND IRON SHAPES

A. Provide standard, well finished, structural shapes or commercial grade bar stock.

1. Structural steel shall conform to ASTM A 36.
2. Rolled shapes shall conform to dimensions and weights of Regular Series Shapes of AISC.

B. Pipe shall be Schedule 40, unless otherwise indicated.

2.03 ALUMINUM SHAPES

A. Provide extruded shapes of 6063-T5 alloy unless another alloy is better suited for the intended purpose.

B. Furnish structural shapes conforming to dimensions and weights of the Standard Structural Shapes of the Aluminum Association of 6061-T6.

2.04 ANCHOR BOLTS AND MISCELLANEOUS FASTENINGS

A. General:

1. Provide as indicated, or as necessary for securing work in place, and anchoring equipment in place.
2. Sizes and spacing of anchor bolts not indicated shall be as required for the intended purpose.

B. Provide anchor bolts, post-installed mechanical anchors, post-installed adhesive anchors, nuts, washers and other fasteners of the materials indicated below unless otherwise indicated on the drawings.

1. Fastening structural steel shapes and plates to each other - ASTM F3125 bolts.
2. Anchoring structural steel to concrete - ASTM A 307 anchor bolts, galvanized.
3. Fastening or anchoring stainless steel or aluminum to any material - Type 316 stainless steel.
4. Anchoring process or mechanical equipment regardless of material to concrete - Type 316 stainless steel.
5. Anchoring or fastening any materials that will be submerged in water or wastewater - Type 316 stainless steel.

6. Any anchors or fasteners in contact with potable water - Type 316 stainless steel.
7. Fastening or anchoring wood or timber in non-submerged application - hot dipped galvanized.
8. Other fasteners and anchor bolts not otherwise specified - Type 316 stainless steel.
9. In contact with chlorine solution - Type 2205 duplex stainless steel.

C. Post-Installed Mechanical Anchors: See Section 01600, General Material and Equipment Requirements.

D. Post-Installed Adhesive Anchors: See Section 01600, General Material and Equipment Requirements.

2.05 INSERTS AND SLEEVES

A. Provide as required and needed for support of piping, equipment and apparatus, or where passages through walls, floors, etc. are required.

B. Size and material shall be as indicated, or as approved by the **County**.

2.06 UNISTRUT CHANNELS

A. Channels shall be accurately and carefully extruded to size from aluminum, except as noted otherwise.

B. Channels embedded in concrete shall be Type 304 stainless steel.

C. Provide a continuous slot with inturned clamping ridges on one side of channel.

D. Fittings to be stainless steel or aluminum.

E. Unless otherwise indicated on the drawings, channels to be 1-5/8" x 1-5/8" x .105" thick.

F. Make all cuts square and free from burrs.

G. Provide end caps on channels.

H. Nuts, pipe hangers, clamps, etc. shall be units specifically intended and manufactured for use with "Unistrut" channels.

I. All nuts, bolts and clamps shall be stainless steel.

J. Provide flexible elastomer material, "Uni-cushion" or equal, between all pipe clamps or hangers and PVC, copper or stainless-steel pipe.

2.07 GALVANIZING

A. Galvanizing of structural steel, where indicated on the drawings, shall be done in accordance with standard specification for zinc coating (hot dip) ASTM designation A 123, A 153, A 143, A 384, A 386 and A 386 latest revision.

1. Provide a minimum of 3 ounces of zinc per sq. ft. for members 1/4" thick and larger.
2. Provide a minimum of 2 ounces of zinc per sq. ft. for members less than 1/4" thick.
3. Fasteners - Comply with ASTM A 325 and ASTM A 153.
4. Pickling is required prior to galvanizing.

2.08 SHOP PAINTING

A. Clean and prime all ferrous metal surfaces with primer compatible with finish coats specified in **Section 09900**.

B. Provide coating or barrier to aluminum in contact with concrete surfaces and between dissimilar metals.

PART 3 - EXECUTION

3.01 GENERAL

A. Install all items, plumb, square and level as intended.

B. Provide coating or barrier to aluminum in contact with concrete surfaces and between dissimilar metals.

3.2 ANCHOR BOLTS

A. Set cast-in anchors to depth required by design.

B. Drill holes for post-installed anchors to depth required by design.

C. Apply "Never-Seize" to bolts.

D. Tighten nuts to manufacturer's written installation instructions using a torque wrench.

E. Maximum protrusion of bolt from top of nut - 3/8".

3.3 UNISTRUT CHANNELS

A. Mount on wall or floor using stainless steel expansion or masonry anchors or embed in concrete where indicated.

B. Install channels level and plumb.

C. Install end caps.

D. Attach securely to support structure with stainless steel wedge anchors.

3.4 REPAIR OF HOT-DIPPED GALVANIZED SURFACES

A. Comply with ASTM A 780.

B. Repair using sprayed zinc coating, minimum dried film of 95% zinc by weight.

C. Clean, dry and remove oil, grease, and corrosion products from surfaces.

D. If the area to be reconditioned includes welds, first remove all flux residues and weld spatter by mechanical means that is, chipping, etc.

E. Wire brush clean the surface to be reconditioned in accordance with SSPC-SP3.

F. Extend surface preparation into the surrounding undamaged galvanized coating.

G. Apply the sprayed coating as soon as possible after surface preparation and before visible deterioration of the surface has occurred.

H. Provide the surface of the sprayed coating with uniform texture, free of lumps, coarse areas, and loosely adherent particles.

I. Provide dry mill thickness of 1 mil greater than specified for the hot-dipped galvanized material.

J. Take thickness measurements with either a magnetic or electromagnetic gage to ensure that the applied coating is as specified.

3.5 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for work under this Section, and the cost of same shall be included in the price bid for the item to which it pertains.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 SCOPE

A. This Section of the Specifications includes, but is not necessarily limited to, standards for cleaning and painting structures and equipment described in the Drawings and Specifications. Furnish all materials, equipment, and labor necessary to complete the Work.

B. Section includes:

1. Surface preparation to receive finishes.
2. Painting, staining, or otherwise finishing of all surfaces.
3. Finishing millwork.

C. Related Work Specified Elsewhere

1. Section 05500, Miscellaneous Metal.

1.02 SUBSTITUTIONS

A. To the maximum extent possible, similar coatings shall be the products of one manufacturer. Guidelines for determination of acceptability of product substitutions are given in Instructions to Bidders. Contractors intending to furnish substitute materials or equipment are cautioned to read and comply strictly with these guidelines.

1.03 SUBMITTALS

A. All submittals and storage and protection provisions shall be in accordance with the requirements of the General Conditions, and the following.

1. Product data:

a. Submit complete list of products for use; indicate compliance with:
   1) Mercury-free composition limits.
   2) VOC limits, when mixed and thinned.
   3) Indicate lead content.

b. Indicate manufacturer, brand name, quality, and type paint for each surface to be finished; correlate to specified item if from other manufacturer than specified item. Refer to the attached sample Paint

Submittal Schedule for required submittal format.

c. Include specified manufacturer's data sheets for reference to submitted manufacturer's data sheets.

d. Manufacturer's Safety Data Sheets (MSDS) for materials.

e. Intent of Contractor to use products specified does not relieve him from responsibility of submitting product line.

2. Samples:

a. Color samples: Submit two sets of color samples from paint manufacturers proposed for use for color selections by Engineer.

b. Brush-outs:

1) Prepare actual brush-outs for each color paint, stain, or finish following final color schedule issuance.

2) Submit brush-outs in duplicate: minimum size, 120 sq. in.

3) Apply products in number of coats specified for actual Work.

4) Provide following substrates for brush-outs:

a) Concrete unit masonry: Paint one face to simulate concrete and masonry.

3. Quality control submittals:

a. Certificates:

1) Indicate interior paints and stains are mercury-free.
2) Indicate lead content. Lead content in excess of 0.06% by weight of nonvolatile content calculated as lead metal is prohibited.
3) Indicate compliance with applicable VOC limits when mixed and thinned.

1.04 PAINTING REQUIREMENTS

A. Finish paint all exposed surfaces except anodized or lacquered aluminum, fiberglass reinforced plastic, stainless steel and copper surfaces. Items to be left unfinished or to receive other types of finishes are specifically shown on the Drawings or specified.

1. Unpainted Products: Full field cleaning and priming will be performed in accordance with specification requirements for unpainted products. Maintain adequate equipment on the site to assure proper cleaning.

2. Shop Primed Products:

   a. Manufactured products may be shop cleaned and primed. Shop cleaning must equal or exceed cleaning specified in the Painting Schedule. Clean as specified and reprime all abrasions, weld splatter, excessive weathering, and other defects in the shop prime coating.

   b. Manufacturers furnishing shop primed products shall certify that cleaning was performed in accordance with specification requirements and that the specified primer was used.

   c. Fully field clean and prime any shop primed products which the Engineer determines that were not cleaned in accordance with the Specifications prior to priming, that the wrong primer was applied, that the primer was applied improperly, or has excessively weathered, or the product is otherwise unacceptable.

3. Finish Painted Products:
   Certain products such as electrical control panels and similar items may be furnished finish painted. Properly protect these products throughout the project to maintain a bright and new appearance. If the finish surfaces are defaced, weathered, or not of the selected color, repaint as necessary in accordance with the paint system manufacturer's written recommendations.

4. Hardware:
   Remove all electrical plates, surface hardware, fittings and fastenings prior to painting operations. These items are to be carefully stored, cleaned and replaced upon completion of Work in each area. Do not use solvent to clean hardware that may remove permanent lacquer finish.

1.05 SEQUENCING AND SCHEDULING

A. Schedule and coordinate this Work with other trades; proceeding until other Work

and job conditions are proper to achieve satisfactory results is prohibited.

B. Examine specification sections for various other trades; be thoroughly familiar with Work required in other sections regarding painting.

PART 2 - PRODUCTS

2.01 MATERIAL SCHEDULE

A. Material schedules list pretreatment coats, wash coats, seal coats, prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for the particular substrate. Maintain the unity of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

2.02 APPLICATION DATA

A. All applicable data currently published by the paint manufacturer relating to surface preparation, coverages, film thickness, application technique, drying and overcoating times is included by reference as a part of this Section. It will be the responsibility of the Contractor to obtain and fully understand the appropriate data sheets for the coatings specified.

2.03 MATERIALS

A. Paints shall be factory mixed and delivered to the job in unbroken original packages bearing the manufacturer's name and brand designation and shall be applied in strict accordance with the manufacturer's printed specifications. Two-component coatings shall be mixed in accordance with manufacturer’s instructions. All two-component coatings, once mixed, shall be applied within the pot-life recommended by the manufacturer.

B. Unless otherwise specified, paints shall be of the best grade. All thinners, driers, varnish, etc., shall be of the best grade and shall be furnished by the coating manufacturer for use with the specified paints.

C. Paint thinners and tints: Products of same manufacturer as paints or approved by paint manufacturer for use with paint.

D. Shellac, turpentine, patching compounds, and similar materials required for execution of Work: Pure, best quality products.

E. All paints, finishes, stains, primers, shellacs, sealants and coatings shall comply with the requirement of LEED 2009 IEQ Credit 4.2: Low-Emitting Materials -

Paintings and Coatings.

2.04 COLORS

A. The Engineer will select the colors to be used on the various portions of the Work. Provide color cards for the coatings proposed. Where more than one coat of paint is required, job tint the paint for each undercoat off-shade to show complete coverage.

B. Review Finish Schedule for color selections that may have already been made by the Engineer.

PART 3 - EXECUTION

3.01 GENERAL

A. Adequately protect other surfaces from paint and damage. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted. Repair damage as a result of inadequate or unsuitable protection.

B. Protection: Cover finished Work of other trades, surfaces not being painted concurrently, and prefinished items.

C. Application of materials in spaces where dust is being generated is prohibited.

3.02 PRODUCT HANDLING

A. Delivery

1. Deliver materials in original, sealed containers of the manufacturer with labels legible and intact.

2. Each container shall be clearly marked or labeled to show paint identification, paint type and color, date of manufacture, batch number, analysis or contents, identification of all toxic substances, and special instructions.

B. Storage

1. Store only acceptable project materials on the project site.

2. Store material in a suitable location and in such a manner as to comply with all safety requirements including any applicable federal, state and local rules and requirements. Storage shall also be in accordance with the instructions of the paint manufacturer and the requirements of the insurance underwriters.

3. Restrict storage area to paint materials and related equipment.

4. Place any materials which may constitute a fire hazard in closed metal containers and remove daily from the project site.

5. Maintain neat, clean conditions in storage area; remove used rags from work areas at end of each day's work; store rags in closed containers.

6. Close containers at end of each day's Work. Leave no materials open.

7. Safety precautions:

   a. Provide temporary fire protection equipment in materials storage area. Mark fire protection equipment location for quick access.

   b. Prohibit smoking in storage area; post signs in visible location adjacent to and within storage area.

3.03 ENVIRONMENTAL CONDITIONS

A. Environmental conditions which affect coating application include, but are not necessarily limited to, ambient air temperature, surface temperature, humidity, dew point and environmental cleanliness. Comply with the manufacturer's recommendations regarding environmental conditions under which coatings may be applied.

3.04 SURFACE PREPARATION

A. General: All surfaces shall be thoroughly clean, dry, and free from oil, grease or dust. All fabricated metal products shall have all weld flux and weld spatter removed and sharp peaks in weld ground smooth. The County inspector will inspect the surface preparation prior to the application of coatings. If the preparation is found to be satisfactory, a written order will be given to proceed with coatings.

B. Ferrous Metals: Standards for the surface preparation of ferrous metals required in the Material Schedules are the standards of the Steel Structures Painting Council (SSPC, SP-1 through SP-10). Inspection of these surfaces will be evaluated by field comparison with visual comparator panels. These panels shall be securely wrapped in clear plastic and sealed to protect them from deterioration and marring.

E. Galvanized metal: Wash with xylol to remove grease, oil, and contaminants; wipe dry with dry cloth.

F. Aluminum: Sand to remove oxides. Wash with xylol to remove grease, oil, and contaminants; wipe dry with dry cloth.

G. Cast-In-Place Concrete Surfaces : No Coatings Required.

3.05 APPLICATION

A. Conditions: No paint shall be applied upon damp or frosty surfaces, or in wet or foggy weather. No paint shall be applied in temperatures below 40^0 F. or when freezing (32^0 F.) is predicted within 24 hours of application, or under temperature or humidity conditions not recommended by the manufacturer.

B. Surface Preparation: After specified surface preparation, all surfaces shall be brushed free of dust or foreign matter. Surfaces shall be completely dry before any paint is applied.

1. Apply materials only when moisture content of surfaces is within manufacturer's recommended range.

C. Application: Paint shall be evenly spread in the proper thickness so that there shall be no drops, runs or sagging of the coating. Where runs and drops do occur, they shall be removed and the surface re-coated to the satisfaction of the Engineer. Sufficient time, as directed by the manufacturer, shall be allowed for the paint to dry before the application of succeeding coats.

1. Apply materials in accord with manufacturer's approved product data to achieve specified DFT.

2. Apply materials using clean brushes, rollers, or spray equipment. Limit paint spraying only to those materials recommended by manufacturer to be sprayed with no loss of performance, durability, or color.

3. Apply materials at rate not exceeding manufacturer's recommendations for surface being coated, less ten percent for losses.

4. Sand and dust between coats to remove defects visible from 5' - 0" distance. Tint primer and intermediate coats slightly to provide slight contrast.

5. Finish coats: Smooth, free of brush marks, streaks, laps or pile-up of paint, skips, or missed areas.

6. Make coating edges adjoining other materials or colors sharp and clean without overlapping.

7. Primer coats may be omitted for surfaces specified to receive factory applied primer if finish coats are compatible with primer. Substitute bond coat recommended by paint manufacturer for specified primer coat if finish coats are not compatible.

D. Protection of Work Area: Use drop cloths or other suitable means to protect other surfaces of the structure or equipment in place. Upon completion of the Work, remove all paint spots from surfaces as directed by the County inspector.

E. Inspection: The County inspector will inspect each coat prior to the application of subsequent coats. If the work is found to be satisfactory, a written order will be given to proceed. Application of additional coats until completed coat has been inspected is prohibited. Only inspected coats of paint will be counted in determining the number of coats applied.

F. Defective Work: Remove and replace, at the direction of the County inspector, any painting work found to be defective or applied under adverse conditions.

3.06 PAINTING SCHEDULE

A. Paint construction on roof top; include mechanical and electrical equipment except as indicated below.

1. None.

B. Surfaces not requiring painting or coating:

1. Face brick.
2. Cast-in-place concrete and Precast concrete.
3. EIFS.
4. Prefinished surfaces and items.
5. Concealed ductwork, conduit, and piping.

C. The Painting Schedule summarizes the painting systems to be applied to the various surfaces.

SAMPLE PAINT SUBMITTAL SCHEDULE

System	Specification	Item	Surface Prep	Primer	Finish & Touch Up	Color
A	SS 5500	Misc. Metals	SSPC 6 for Non-Immersion	Tnemec 90-97	2 Coats of 89 Series for Non-Immersion at 4-6.0 mils	Warm Gray M3759
B	SS 5500	Misc. Metals	SSPC 10 of Immersion	Not Required	2 Coats of 78 Series for Immersion at 4-6.0 mils	Gray
C	SS 5500	Roof Hatch	Mill Finish Aluminum	Not Required	Not Required	Not Required

PAINTING SCHEDULE

Surfaces	Substrate Materials	Paint Material/Schedule
All Other Listed Metal Surfaces, Except Dumpsters	Galvanized Metal	141*
	Ferrous Metal	141

* Galvanized metal shall not be painted unless called for on the Finish Schedule.

MATERIAL SCHEDULE 141

TYPE: HIGH BUILD EPOXY

USE: PROVIDE THE FOLLOWING COATING SYSTEM FOR FERROUS METAL SURFACES ON ALL MECHANICAL EQUIPMENT AND ACCESSORIES INCLUDING BUT NOT LIMITED TO: PUMPS, VALVING AND OTHER PROCESS EQUIPMENT AND EXTERIOR STRUCTURAL STEEL AND

EXPOSED STEEL PIPE.

SURFACE PREPARATION: SSPC-SP10 NEAR WHITE BLAST-IMMERSION SERVICE

SHERWIN-WILLIAMS

PRIMER: ZINC CLAD III - 3.0 MILS*

FIRST COAT: MACROPOXY 646-100 FC - 4.0 MILS*

SECOND COAT: ACROLON 100 URETHANE - 3.0 MILS*

* MINIMUM DRY FILM THICKNESS

NOTES:

1. IF MINIMUM TOTAL DRY FILM THICKNESS OF 10.0 MILS IS NOT ACHIEVED IN THE NUMBER OF COATS SPECIFIED, ADDITIONAL COATS SHALL BE APPLIED AT NO ADDITIONAL COST TO THE OWNER.

2. PRODUCTS OF THE FOLLOWING MANUFACTURERS SIMILAR IN TYPE, COLOR, SOLIDS AND QUALITY TO THE PRODUCTS SPECIFIED ABOVE ARE ACCEPTABLE FOR USE, SUBJECT TO APPROVAL OF PRODUCT LIST AND SAMPLES:

   a. Koppers.
   b. Tnemec.

PIPE AND EQUIPMENT COLORS

STENCIL WORDING	SYMBOL	COLOR	LETTERS & ARROW
Raw Water		SW6366-BLUEBLOOD	YES AND DIRECTION OF FLOW
Potable Water		SW6366-BLUEBLOOD	YES AND DIRECTION OF FLOW
Non-Potable Water	W3	SW6366-BLUEBLOOD	YES AND DIRECTION OF FLOW
Compressed Air		SW4084-SAFETY YELLOW	YES
Air Vacuum	ARV		YES
Vent	V		YES

END OF SECTION

SECTION 10430

EXTERIOR SIGNS

PART 1 - GENERAL

1.01 SCOPE

A. Work described in this Section includes providing all non-illuminated wall mounted and post mounted signs complete with all components by single manufacturer at locations indicated on the Drawings. Provide all exterior signs from same manufacturer.

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 Conditions of the Contract Documents. In addition, the following specific information shall be provided:

1. Shop drawings.

a. Submit complete shop drawings; indicate all materials, sizes, configurations, applicable substrate mountings, and required location of connections provided in other sections. Specifically indicate tolerances required from other sections for base mounted modules.

b. Submit typography sample for copy. Use Century Gothic Bold.

c. Submit art work for special graphics.

d. Templates - Furnish templates required for locations of anchors installed by others.

2. Product data.

a. Submit manufacturer's signed statement regarding compliance with Article 1.04, Paragraph A.

b. Submit manufacturer's product literature indicating units and designs selected.

c. Submit maintenance data and cleaning requirements for all exterior surfaces.

1.03 QUALITY ASSURANCE

A. Reference Standards: Comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:

1. AA, Aluminum Association.
2. ANSI, American National Standards Institute.
3. ASTM, American Society for Testing and Materials.

B. Manufacturer Qualifications: Provide Work required under this section from manufacturers regularly engaged in Work of this magnitude and scope for minimum of five years.

C. Pre-installation Conference: Closely coordinate tolerances required in this section for installation to bases supplied in other sections.

1.04 QUALITY STANDARDS

A. Acceptable Product:

1. Other manufacturer's products are acceptable if submitted in accord with Product Options and Substitutions section and are in strict compliance with these specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Coordinate delivery of Work to Project site under this section for immediate installation.

B. Handling materials and equipment: Handle signage in careful manner in order not to damage or mar surfaces of signs or adjacent finish surfaces as applicable.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate installation with adjacent finish materials in manner not to destroy adjacent surfaces.

B. Coordinate with other sections for cast-in or built-in anchors and mounting hardware required in Work accomplished in other sections.

1.07 WARRANTY

A. Provide manufacturer's standard five-year limited warranty covering coating degradation, chalking, fading, and fiberglass delaminating.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Types:

1. Post and panel.

B. Sizes:

1. 48” tall x 24” wide. Bottom of sign 24” above grade.

C. Design units with selected components specified in Article 2.02.

2.02 COMPONENTS

A. Graphics Panel Module:

B. Posts:

1. Material. - Aluminum
2. Post profile. - square
3. Finish and color: Double faced painted aluminum panels.
4. Design post for panel size: individual lengths required by manufacturer for in ground mount.

C. Graphics:

1. Special note. Use of clear overcoat on completed graphics regardless of colors or types selected is strictly prohibited.
2. Pressure sensitive graphics (PSG) colors. Selected by Architect/Engineer.
3. Type.
    a. Size – 2” minimum
    b. Style – Retroreflective as selected by Owner.
    c. Type code – Century Gothic Bold

2.03 ACCESSORIES

A. Provide miscellaneous hardware and items required for installation of in-ground and base mounted sign modules.

2.04 FABRICATION

A. Fabricate units to configurations indicated on reviewed shop drawings. Internally reinforce units in accord with reviewed shop drawings.

B. Provide copy required on reviewed shop drawings in accord with manufacturer's standard procedures.

C. Fabricate posts to lengths required for in-ground mounting.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive sign modules; verify for proper location of cast-in anchors installed under other sections.

B. Notify Engineer in writing of unacceptable substrate or improper location of anchors. Beginning Work indicates acceptance of substrate. Subsequent modifications to substrate or modules become this section's complete responsibility.

3.02 INSTALLATION

A. Install sign modules in locations indicated on drawings in accord with reviewed shop drawings. Square, plumb, and level units.

B. Bore required holes for post mounted sign modules; set and align posts; fill and compact space around post with concrete.

3.03 CLEANING

A. Clean all exposed surfaces just prior to Date of Substantial Completion in accord with manufacturer's written cleaning instructions.

3.04 SCHEDULES

A. Coordinate schedules with Engineer.

EXTERIOR SIGN TYPES

E.1: Parking Space Identity

Polysign Series 4160.2. Size: Panel-1/4" x 12" x 12". Post-2" x 2" x 4'. Posts and panel to have painted finish. Pressure-sensitive graphics and field color to be chosen from standards. "Visitor" to be 2" high; "Symbol" to be 8" high. Format: center/center.

Handicapped
Electrical Charging Sign

E.2: Directional Sign

Polysign Series 4120.1. size: 2" X 48" high x 24" wide. Posts and panel to have painted finish. Pressure-sensitive graphics and field color to be chosen from standards. Arrows to be 3"; lettering not to exceed 2" high. Units to have 6' posts furnished. Format: Flush left.

E.3: Building ID

Similar to directional sign

E.4: NOT USED

END OF SECTION

SECTION 10730

METAL CANOPIES

PART 1 - GENERAL

1.01 Scope

A. Work included: Design, furnishing and installing metal canopies and their anchorage and foundation.

B. Related Work: General Material and Equipment Requirements, Cast-In-Place Concrete, Metal Fabrications

1.02 References

A. The Aluminum Association (AA):
   1. The Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. American Society of Civil Engineers (ASCE):
   1. ASCE 7, Minimum Design Loads for Buildings and Other Structures.

D. American Society for Testing and Materials (ASTM):
   1. ASTM B 209, Specification for Aluminum and Aluminum- Alloy Sheet and Plate.
   2. ASTM B 221, Specification for Aluminum and Aluminum- Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. American Welding Society (AWS):
   1. ANSI/AWS D1.2, Structural Welding Code - Aluminum.

1.03 Design Requirements

A. Design Requirements:
   1. Design canopy, anchorage and foundation in accordance with the

governing codes and design criteria as indicated on the Drawings and as specified herein.
2. Comply with the wind requirements of ASCE 7.

1.04 Submittals

A. Product Data: Manufacturer's product information, specifications, and installation instructions for canopy components and accessories.

B. Shop Drawings: Shop drawings showing configuration, dimensions, plans, elevations, and construction and installation details.

C. Design Data: Design calculations bearing the seal of a Registered Professional Engineer, licensed in the state where the project is located. Design calculations shall state that the canopy system design complies with the wind requirements of the ASCE 7, the stability criteria of applicable building code, and all other governing criteria.

1.05 Quality Assurance

A. Manufacturer Qualifications: At least ten years of experience in the design, fabrication, and erection of extruded aluminum framing.

B. Installer Qualifications: Company experienced in assembly and installation of aluminum framing with 5 years successful experience.

C. Perform welding by certified operators in accordance with AWS D1.2.

1.06 Product Handling

A. All materials shall be delivered in manufacturer's original packaging.

B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

C. Remove protective wrapping immediately after installation.

1.07 Substitutions

A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before the bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.08 Job Conditions

A. Verify that other trades with related work are complete before installing jib crane.

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

D. Do not install products under environmental conditions outside manufacturer's recommended limits.

E. Observe all appropriate OSHA safety guidelines for this work.

PART 2 - PRODUCTS

2.01 Framing Materials

A. Aluminum Members: Extruded aluminum, ASTM B 221, 6063 alloy, T6 temper.

B. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.

C. Gaskets: Dry seal santoprene pressure type.

D. Aluminum Flashing: ASTM B 209, Type 3003 H14, 0.040-inch, minimum.

E. Finish: Anodized.

2.02 Roofing Materials.

A. Manufacturer and Product: Epic Steel, Snap Lock or pre-approved equal. Capacity shall match jib crane capacity.
B. Thickness: 24 gage, minimum.
C. Depth: 1 1/2 inches, minimum.
D. Coating: Galvalume.

2.03 Anchorage

A. Designed by Contractor's qualified professional engineer, who is a civil or structural engineer registered in the in the State of Georgia.

B. Refer to Section 05500, Metal Fabrications.

2.04 Fabrication

A. General
   1. Shop Assembly: Assemble components in shop to greatest extent possible to minimize field assembly.
   2. Welding: In accordance with ANSI/AWS D1.2.
   3. Bent Construction: Factory assemble beams to columns to form one-piece rigid bents. Where used make welds smooth and uniform using an inert gas shielded arc. Perform suitable edge preparation to assure 100% penetration. Grind welds only where interfering with adjoining structure to allow for flush connection. Field welding is not permitted. Rigid mechanical joints can be used if supported by engineering calculations and/or testing.

B. Beams and Columns: Provide radius-cornered tubular extrusions.

C. Fascia: Manufacturer's standard shape. Provide fascia splices where continuous runs of fascia are jointed. Locate splices to be in line with bents and fasten in place on hidden or non-vertical surfaces.

PART 3 - EXECUTION

3.01 Examination

A. Do not begin installation until support structures have been properly prepared.

B. Design and construction of reinforced concrete footings and slabs as detailed on Drawings and specified in other sections. Verify that accurate canopy applied forces and anchor bolt patterns are provided for foundation design.

3.02 Installation

A. Install units and accessories in accordance with manufacturer's instructions and approved shop drawings

B. Erect canopy true to line, level, and plumb.

C. Provide hairline miters and fitted joints.

3.03 Protection

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 11020

VAULT DOORS

PART 1 - GENERAL

1.01 Summary

A. Work included: Furnishing and installing factory fabricated vault access doors

B. Related Work: Precast Wetwell; Precast Vaults

1.02 References

A. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428-2959; (610) 832-9585, fax (610) 832-9555

1. ASTM A 36: Standard Specification for Structural Steel

1.03 Submittals

A. Product Data: Provide manufacturer's product data for all materials in this specification.

B. Shop Drawings: Show profiles, accessories, location, and dimensions.

C. Samples: Manufacturer to provide upon request; sized to represent material adequately.

D. Contract Closeout: Vault access door manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.04 Product Handling

A. All materials shall be delivered in manufacturer's original packaging.

B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

C. Remove protective wrapping immediately after installation.

1.05 Substitutions

A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.06 Job Conditions

A. Verify that other trades with related work are complete before installing vault access door(s).

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

D. Observe all appropriate OSHA safety guidelines for this work.

1.07 Warranty/Guarantee

A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (10) Ten years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.01 Manufacturer

A. The BILCO Company

B. U.S.F. Fabrication, Inc.

C. Jensen Precast

D. Or a pre-approved equal.

2.02 Access Doors

A. Furnish and install where indicated on plans vault access doors. The vault access doors shall be type aluminum, double leaf.

B. Performance characteristics:

1. Cover: Shall be reinforced to support 300 PSF pedestrian loads.

2. The cover shall be opened using the flush lifting handle to insure controlled operation throughout the entire arc of opening and closing.

C. Cover: Shall be minimum 1/4" aluminum diamond plate reinforced to support 300 PSF pedestrian loads.

D. Frame: Angle frame shall be minimum 1/4” (6.3mm) extruded aluminum with a continuous anchor flange around the entire perimeter of the frame.

E. Hinges: Shall be through bolted to the cover with tamperproof type 316 stainless steel bolts and locknuts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.

F. A flush lifting handle shall be provided

G. Lifting mechanisms: Manufacturer shall provide the proper amount of lift assist to insure that the cover can be opened by one person with no more than 40lbs of lifting force required.

H. Hardware:

1. Hinges Type 316 stainless steel hinges shall be provided.

2. Cover shall be equipped with a 316 stainless steel hold open arm, with secondary latch which locks the cover in its full upright and open position.

3. A staple for a padlock shall be provided

4. Hardware: Shall be Type 316 stainless steel throughout.

I. Finishes:

1. Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

2. An adhesive backed vinyl material, that protects the product during shipping and installation, shall cover the entire top of the door

PART 3 - EXECUTION

3.01 Inspection

A. Verify that the vault access door installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 Installation

A. Submit product design drawings for review and approval to the architect or specifier before fabrication.

B. The installer shall check as-built conditions and verify the manufacturer's vault access door details for accuracy to fit the application prior to fabrication. The installer shall comply with the vault access door manufacturer's installation instructions. Installer shall insure that the entire unit is installed level and square to insure proper performance.

C. The installer shall furnish mechanical fasteners consistent with the vault access door manufacturer's instructions.

END OF SECTION

SECTION 11303

SUBMERSIBLE SOLIDS-HANDLING PUMPS

PART 1 - GENERAL

1.01 Scope

A. The contractor shall furnish and install two submersible solids-handling pumps and associated equipment equal to the performance tabulated in schedule at end of section. The installation shall be complete with all needed equipment, control system, and lifting equipment.

B. The principal items of equipment shall include two vertical, close-coupled, motor driven, non-clog pumps; local three-phase power and control panel with circuit breakers: motor circuit protectors; motor starters; pressure transducer level sensor; 120v and 24v control power transformers; and all internal wiring. System shall also include duplex, freeze-protected liquid fill discharge pressure gauges. System shall also include guide rail systems for removal or re-installation of pumps.

C. Design and provide anchorage to concrete, including embedment depth. The following shall be submitted by the Contractor:

1. Detailed drawing with anchorage and embedment dimensions.

2. A table of applied forces.

3. A complete bill of materials.

4. Stamp of a Registered Professional Engineer, registered in the State of Georgia, experienced in pump support and anchorage design.

5. Detailed connections to the existing structure.

6. Indicate all welds, both shop and field, by Standard Units of Measurement as specified in AWS D1.1-1.7.

D. Submittals. In addition to requirements listed in 01300 Submittal Procedures, provide the following:

1. Storage Requirements

2. Transportation

3. Quality Assurance certification

4. Testing procedures

5. Operations and Maintenance manuals

6. List of spare parts

PART 2 – PRODUCTS

2.01 Main Pumps

A. The submersible pumps shall be 6-inch discharge vertical, centrifugal non-clog type of heavy cast-iron construction, especially designed for the use of mechanical seals and self-priming. The shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. The motor shaft shall be directly connected to the impeller without the use of drive belts or couplings. The shaft shall be solid stainless steel through the mechanical seal. The pump impeller shall be of the enclosed two-port type made of close-grained cast-iron and shall be balanced.

B. Mechanical seals:

1. Pump shall be provided with tandem double opposed heavy-duty mechanical seals running in an oil reservoir, composed of two separate lapped face seals. The lower seal unit, between the pump and oil chamber, shall consist of one stationary and one positively driven, rotating silicon-carbide ring and one positively driven silicon-carbide or rotating carbon ring. Ceramic seals will not be acceptable.

2. The seals shall require neither maintenance nor adjustment and shall be easily replaceable. Conventional double mechanical seals with a single or a double spring between the rotating faces, or that require constant differential pressure to effect sealing and are subject to opening and penetration by pumping forces, will not be acceptable. The submersible pumps shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet.

3. Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to assure that air is left in the oil chamber, to absorb the expansion of the oil due to temperature variations. The drain and inspection plug with positive anti-leak seal shall be easily accessible from the outside.

4. A moisture detection sensor shall be provided in the motor housing to detect the seal failure.

C. Cable and Cable Entry Seal: The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible

seal. The cable entry shall be comprised of a single cylindrical elastomer grommet having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. The power cable shall be of sufficient length to reach pump control panel without splicing. It shall be the Contractor's responsibility to coordinate the cable length.

2.02 Motors

A. The initial conditions' pump motor shall be not greater than 15 hp and suitable for 480V, 60 Hz, three-phase. The future use pump motor shall not be greater than 20 hp. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air-filled or oil-filled, watertight chamber. Motor shall have a service factor of 1.2 or greater. Motors shall be sized to operate below their full load amps; operating in the service factor is not acceptable.

B. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which shall be rated at a temperature of 155 degrees C. The motor shall be designed for continuous duty, capable of sustaining a maximum of 10 starts per hour.

C. The junction chamber, containing the terminal board, shall be hermetically sealed from the motor. Connection between the cable conductors and stator leads shall be made with threaded compressed-type binding post permanently affixed to a terminal board. The submersible electrical cable shall be of sufficient length to reach the junction box.

D. Pump motors shall be equipped with motor winding thermal (one for each phase) and seal failure protection sensors. The sensors' cables shall be prewired to the motor for connection to the associated protection relays mounted in pump control panel.

E. The motor shall be suitable for Class 1, Division 1 environments.

2.03 Controls

A. One (1) control panel shall be supplied by pump manufacturer to power, control and monitor the pumps. The pump control panel shall contain all of the necessary components for system operation including, but not limited to the following:

1. Main 125A, 3P circuit breaker with a lockable handle for lock out purposes on the exterior of the panel. The switch shall be operable without opening the panel, shall be interlocked with the panel door and shall be capable of being padlocked in the "Off" position.

2. 2 kVA, 480/120V control power transformer with primary and secondary fuses
3. Motor Circuit Protectors (MCP) and NEMA rated RVSS starters sized for each pump motor HP (enclosure shall be sized to accommodate future 20HP motor circuit protector and RVSS motor starter for each future 20HP pump)
4. Surge Protective Device (SPD) for incoming 480V power
5. One (1) 20A, 480V, 3P circuit breaker for jib crane
6. Elapsed time meters for each pump
7. UPS sized for 30min backup time
8. Phase monitor. Include a dry 5 Amp, 120VAC rated contact for “Power Fail” alarm to SCADA system
9. Panel interior lighting fixture with door switch.
10. Flygt Multi-Smart controller to accommodate all listed I/Os Include 20% spare I/Os of each type.
11. 24VDC Power Supply
12. Level Indicator for submersible pressure transducer signal
13. Thermal and seal failure relays for each pump
14. 120V surge protector
15. Pumps alternator
16. Time delay relay (0-10 sec) for between pumps start in both "Hand" and "Auto" modes
17. Surge protectors for all analog signals to/from the panel.
18. Alarm Lightand Reset pushbuttons
19. Panel interior 120VAC duplex receptacle
20. Panel space heater, fan and thermostat
21. The following devices shall be mounted on the panel front:
    - Hand-Off-Auto selector switches for each pump
    - Start and Stop pushbuttons for each pump in Hand mode only.
    - Indicating lights for each pump Running, Stopped, Overtemperature, Seal Leakage and Overload conditions
    - Indicating light for wetwell high level from high level float switch
    - Alarm Reset pushbuttons.
    - Mushroom-head E-Stop pushbutton for site security
22. All other components (fuses, circuit breakers, relays, etc.) for pumps safe and proper operation.
23. Pilot device colors:
    - Run: Red
    - Off: Green
    - Warning: Amber

B. Control panels shall have NEMA 4X stainless steel enclosures.

1. White epoxy painted stainless steel panel
2. 3 point handle latch
3. Sun shield: aluminum, epoxy painted white

C. All control wiring shall be 24 VDC.

D. All wire tags inside the panels shall be legible and shall not deteriorate under adverse conditions.

E. The following auxiliary dry contacts (120VAC, 5 Amp rated) and signals shall be provided:

1. PUMP 1 RUNNING
2. PUMP 2 RUNNING
3. PUMP 1 COMMON FAULT
4. PUMP 2 COMMON FAULT
5. WETWELL HIGH LEVEL ALARM
6. WETWELL LOW LEVEL ALARM
7. WETWELL LEVEL (PRESSURE)
8. NORMAL POWER LOSS
9. PHASE LOSS
10. POWER ON
11. PHASE A CURRENT
12. PHASE B CURRENT
13. PHASE C CURRENT
14. GENERATOR RUNNING STATUS
15. GENERATOR FAULT
16. ATS EMERGENCY POSITION
17. SITE SECURITY

F. Include submersible pressure transducer for wetwell level measuring. The pressure transducer shall be of the solid state head pressure sensing type, suitable for continuous submergence in wastewater. Pressure transducer shall produce a 4-20 mA signal directly proportional to the measured level of submergence. Transducer housing shall be constructed of Type 316 stainless steel. Transducer shall be suitable for Class 1, Division 1 environment.

Transducer shall be provided with a sufficient amount of cable to reach the pump control panel without splicing.

G. One (1) High-High Level float, one (1) High Level float and one (1) Low Level float shall be provided in the wet well. Floats switches shall be non-mercury tilt type switches with dry contacts rated at 5 Amps at 120 VAC. Float switches shall be suitable for Class 1, Division 1 environment. Float switches shall be provided with a sufficient amount of cable to reach the pump control panel without splicing.

H. Thermal sensor relay and alarm light, push to test, with latching relay to hold light in “on” position upon high temperature trip while allowing the circuit to reset upon cool down automatically.

I. Seal Failure relay and warning light, push to test and warning only.

J. Flashing Alarm Light, with reset pushbutton for high level. The alarm light shall be a weatherproof-shatterproof red/green/amber light fixtures mounted on top of canopy to indicate operating, warning, and alarm conditions. The alarm light shall be turned on by the alarm level. The alarm light shall flash until the alarm condition ceases to exist. Circuit should reset upon alarm condition clearing.

K. See Electrical Drawings for additional details.

2.04 Main Piping

A. The pump suction connections shall be drilled and tapped for a 125-pound ANSI flange. See Section 15100 for reference.

2.05 Manufacturers

B. Flygt

C. Approved equal

PART 3 - EXECUTION

3.01 Startup

A. The manufacturer shall provide the services of a factory-trained representative for a period of one 8-hour day on-site to perform initial startup of the pump station and to instruct the owner's operating personnel in the operation and maintenance of the equipment.

Submersible Solids-Handling Pump Schedule:

Parameter	Value
Quantity	2
Duty flow, gpm	200
Duty head, ft	70
Power source	460V, 3p
Discharge, in	6
Maximum allowable solids passing, in	4
Motor power rating, hp	15
Max speed, rpm	1755
Max shutoff head, ft	75

END OF SECTION

SECTION 14650

JIB CRANES

PART 1 - GENERAL

1.01 Scope

A. Work included: Furnishing and installing free standing jib cranes, anchorage and foundation.

B. Related Work: 01600 General Material and Equipment Requirements, 03300 Cast-In-Place Concrete, 05500 Metal Fabrications

1.02 References

A. American Institute of Steel Construction (AISC) - Specification for Structural Joints Using High-Strength Bolts.

B. American National Standards Institute (ANSI): ANSI B30.11 - Monorails and Underhung Cranes.

C. ASTM International (ASTM):
   1. ASTM A36 - Carbon Structural Steel.
   2. ASTM F3125 – High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
   3. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

D. American Welding Society (AWS) D1.1 - Structural Welding Code.

E. Occupational Safety and Health Administration (OSHA) - Specification 1910.179 - Overhead and Gantry Cranes.

1.03 Design Requirements

A. Design Requirements:
   1. Design jib crane, anchorage and foundation in accordance with the governing codes and design criteria as indicated on the Drawings and as specified herein.
   2. Comply with the wind requirements of ASCE 7.

1.04 Submittals

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Describe capacities, performance, operation, and applied forces to foundation.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

B. Shop Drawings: Shop drawings showing configuration, dimensions, service area, and construction and installation details.

C. Contract Closeout: Jib crane manufacturer shall provide the manufacturer’s Warranty prior to the contract closeout.

1.05 Quality Assurance

A. Manufacturer Qualifications: Company specializing in designing and manufacturing cranes with 25 years successful experience.

B. Installer Qualifications: Company experienced in assembly and installation of cranes with 5 years successful experience and acceptable to crane manufacturer.

C. Perform welding by certified operators in accordance with AWS D14.1.

D. Bolted connections shall be in accordance with torque tightening procedures specified in AISC Specification.

E. Clearly label crane with rated load capacity. Place label at height and location easily read from floor level and loading position.

1.06 Product Handling

A. All materials shall be delivered in manufacturer’s original packaging.

B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

C. Remove protective wrapping immediately after installation.

1.07 Substitutions

A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor

guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.08 Job Conditions

A. Verify that other trades with related work are complete before installing jib crane.

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

D. Do not install products under environmental conditions outside manufacturer's recommended limits.

E. Observe all appropriate OSHA safety guidelines for this work.

1.09 Warranty/Guarantee

A. Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace assemblies and components that fail in materials and workmanship within warranty period from date of Substantial Completion. 5 years or 10,000 hours warranty for jib crane to cover defects in materials and workmanship. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.01 Manufacturer

A. Gorbel, Inc.

B. Or a pre-approved equal.

2.02 Jib Cranes

A. Performance:
   1. Crane shall be designed, fabricated, and installed in accordance with ANSI B30.11 and OSHA 1910-179.
   2. Crane shall be designed for minimum effort manual rotation.
   3. Boom shall not drift when at rest.
   4. Maximum deflection at boom end: 1/150 span based on capacity plus 15 percent for hoist and trolley weight.
   5. Crane shall be designed to withstand the following:

a. Live load capacity equal to net rated hook load: 1 ton.
b. Base crane structural design on live load capacity plus 15 percent for hoist and trolley weight and 25 percent for impact.

B. Free Standing Jib Crane: Crane shall consist of mast requiring foundation support and a 360 degree rotating boom. Provide rotating collector assembly with service entrance and festoon service support as indicated.
1. Acceptable Manufacturer and Model: Model No. FS300 as manufactured by Gorbel, Inc.: Base plate mounted crane.
2. Base plate mounting: Provide hexagonal steel base plate welded to mast for anchoring crane to concrete foundation cast flush with floor slab.
3. Construction: Fabricate from ASTM A36 steel sections with finished ends and surfaces.
4. Mast: Stationary steel pipe, perpendicular to boom. Equip mast top with plate and pivot pin to receive head assembly.
5. Boom: Horizontal, wide flange steel beam bolted to head assembly and designed for hoist trolley traveling on bottom flange. Reinforce with cap channel as required for lateral stability. Equip boom with stops to limit movement of trolley.
6. Head assembly: Welded steel plate and channel fabrication fitted over mast, bolted to boom, and designed to transfer boom load to mast and to rotate. Assembly shall allow for installation of head prior to boom attachment and provide maximum hoist lift.
a. Top pivot bearing assembly: Designed to connect head assembly to mast and transfer load from boom. Weight bearing channel connecting sides of head assembly shall contain tapered roller bearings allowing easy rotation.
b. Retaining pin: Inserted through mast pivot pin above weight bearing channel to prevent accidentally dislodging head assembly. Cranes without retaining pin are not acceptable.
c. Trunnion roller assembly: Designed to rotate around mast and transmit moment force from boom to mast. Provide trunnion rollers with tapered bearings held in steel channel with 1 inch (25 mm) diameter bolts. Masts less than 18 inches (457 mm) diameter shall have 2 rollers and larger masts shall have 4 rollers. Assembly shall rotate around mast with full roller face contact. Roller surface shall be sufficiently large to prevent cutting into mast. Cranes with small rollers or cams requiring wear band on mast are not acceptable.

2.03 Trolley and Hoist:

A. Columbus McKinnon (CM) Lodestar Electric Chain Hoist Model L or pre-approved equal. Capacity shall match jib crane capacity.

2.04 Anchorage

A. As required by jib crane.

B. Designed by Contractor’s qualified professional engineer, who is a civil or structural engineer registered in the in the State of Georgia.

C. Refer to Section 05500, Metal Fabrications.

PART 3 - EXECUTION

3.01 Examination

A. Do not begin installation until support structures have been properly prepared.

B. Design and construction of reinforced concrete footings and slabs as detailed on Drawings and specified in other sections. Verify that accurate crane applied forces and anchor bolt patterns are provided for foundation design.

3.02 Installation

A. Install units and accessories in accordance with manufacturer's instructions and approved shop drawings. Do not modify crane components in any manner without advance written approval by crane manufacturer.

B. Clearances for Moving Crane Components:
   1. 3 inches (76 mm) minimum vertical clearance from any overhead obstruction.
   2. 2 inches (51 mm) minimum horizontal clearance from any lateral obstruction.
   3. Prior to applying proper torque to the bolts, ensure runways are:
      a. Level to within plus or minus 1/8 inch in 20 feet (3 mm in 6.1 m).
      b. Parallel with opposite runway to within plus or minus (3 mm in 6.1 m).

3.03 Field Quality Control

A. Perform field quality control testing as recommended by manufacturer. Move bridge and hoist trolley through entire travel to ensure crane is clear of obstructions and moves freely and smoothly. Inspect installed crane. Verify all bolts are tight and lock washers fully compressed.

B. Field test crane and accessories for operating functions. Ensure crane movement is smooth and proper. Adjust as required and correct deficiencies.

C. Clean surfaces. If necessary, touch-up paint damage, scratches, and blemishes with manufacturer provided matching paint. Protect crane from other construction operations.

3.04 Demonstration and Training

A. Provide demonstration and training session for Owner's representative covering operation and maintenance.

3.05 Protection

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION

SECTION 15056

PIPE SUPPORTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Design, and provide a complete system of pipe supports with inserts, bolts, nuts, restraining and hanger rods, washers, miscellaneous steel, sliding Teflon plates, anchorage to concrete including embedment depth, and accessories as indicated and specified. The term pipe support includes hangers, guides, restraints, anchors, anchorage embedment, and saddles.

B. Provide all support systems and the design of all support systems for all piping as specified herein. The Contractor shall provide pipe support locations, configurations and details through accepted shop drawing submittals stamped by a Registered Professional Engineer as specified herein.

C. The Contractor shall be responsible for the proper design, fabrication, location, shop drawings and installation of all pipe supports in accordance with the specified requirements.

D. Pipe support locations and types for piping ½ in. and larger shall be determined by the Contractor using the guidelines for support spacing specified herein and other criteria contained in this pipe support specification. Guidelines for pipe supports may need to be adjusted based upon field coordination, field routing, or other considerations outlined herein such as structural load limits. The Contractor may revise the pipe support locations and details through accepted shop drawing submittals stamped by a Registered Professional Engineer as specified herein. The Contractor is responsible for the proper design, installation and fabrication of all pipe supports in accordance with the specified requirements. For pipe supports ½ in. and larger pipe support shop drawings together with a marked-up piping drawing showing support number, location and typical type shall be submitted by the Contractor for acceptance.

   The Contractor shall be responsible for coordinating all pipe support designs for all trades to ensure compliance with all the requirements of this specification, including but not limited to the total limitations specified in paragraph 2.03 J.

E. Design and provide all temporary pipe supports required during installation and testing.

1.02 RELATED WORK

A. Division 1: General Requirements

B. Section 02634: Ductile Iron Pipe Discharge Piping and Accessories

C. Section 03300: Cast-in-Place Concrete

D. Section 15100: Valves and Appurtenances

1.03 REFERENCES

A. American Institute of Steel Construction (AISC) Manual of Steel Construction.

B. American Society for Testing and Materials (ASTM) Publications:

1. A36: Specification for Structural Steel.

2. A500: Cold formed welded and seamless carbon steel structural tubing.

3. E165: Practice for Liquid Penetrant Inspection Method.

4. E709: Practice for Magnetic Particle Examination.

5. A307: Specification for Carbon Steel Bolts and studs, 60,000 psi Tensile.

6. A312: Seamless and welded austenic stainless steel pipe.

7. A572: Specification for Steel Plate.

C. American National Standards Institute (ANSI):

1. ASME/ANSI B31.1: Power Piping Code.

D. American Welding Society (AWS) Code:

1. Structural Welding Code D1.1.

E. Manufacturers' Standardization Society (MSS):

1. MSS SP-58: Pipe Hangers and Supports - Materials and Design.

2. MSS SP-69: Pipe Hangers and Supports - Selection and Application.

3. MSS SP-89: Pipe Hangers and Supports - Fabrication and Installation Practices.

4. MSS SP-90: Guidelines on Terminology for Pipe Hangers and Supports

F. National Association of Expansion Joint Manufacturers: Standards of the Expansion Joint Manufacturers Association, Inc.

G. OSHA

1.04 SEISMIC DESIGN REQUIREMENTS

A. Conform to the requirements as indicated on the structural drawings and as specified herein.

1. Unless otherwise noted on the structural drawings, all pipe supports shall be designed with a seismic importance factor, $I_p = 1.0$.

B. It shall be the responsibility of the Contractor to conform to the seismic design requirements for this project and for the work of this specification section.

C. Provide all pipe supports designed in accordance with the seismic requirements indicated and specified.

D. Additionally, provide with the Certificate of Design, certification signed by a registered structural engineer stating that computations were performed and that all components have been sized for the seismic forces specified and indicated.

1.05 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with the General Conditions:

1. Pipe support drawings specified in paragraph 1.01 and including data for accessory items for acceptance prior to fabrication. The Contractor shall submit pipe support coordination drawings including all piping and pipe supports for all trades.

a. Detailed drawing of the device with dimensions.

b. A table of applied forces and moments.

c. A complete bill of materials.

d. A unique identification and revision level.

e. Stamp of a Registered Professional Engineer, registered in the State of Georgia, experienced in pipe support design and pipe stress analysis as specified in paragraph. 1.06 D.

f. Detailed connections to existing structure.

g. Indicate all welds, both shop and field, by Standard Units of Measurement as specified in AWS D1.1-1.7.

2. Welding Procedure: Submit description as required to illustrate each welding procedure to be performed in the specified work.

3. Welding Equipment: Submit descriptive data for welding equipment, including type, voltage and amperage.

4. Qualification for Welders: Provide certification that welders to be employed in work have satisfactorily passed AWS or ASME qualification tests. If certification of welders is required, retesting is the Contractor's responsibility at no additional cost to the Owner.

5. Pipe support manufacturers' qualifications as specified in paragraph 1.06 D.

   a. List of at least five (5) successful pipe support projects and current addresses and telephone numbers of persons in charge of representing the owner or the owner of those construction projects during the time of pipe support design, fabrication and installation.

   b. Qualification of manufacturers' Registered Professional Engineer, registered in the state where this project is being constructed, whom stamps and seals shop drawings and designs.

6. Coordination drawings for pipe supports shall include as a minimum the following information.

   a. These coordination drawings will be used by the Contractor to ensure that the pipe supports do not obstruct access, access for equipment operation or removal including all mechanical and electrical equipment, panels, valves, gauges, and instrumentation.

   c. The Contractor shall be responsible for including and coordinating the work of all subcontractors into the coordination drawings.

   d. Prepare reproducible coordination drawings, indicating equipment, piping, valves, expansion joints, ductwork, conduit, cable trays, junction boxes, lighting fixtures, sleeves, inserts, embedments, supports, hangers and appurtenances at not less than 1/4-inch scale. Drawings shall show beams, columns, ceiling heights, wall, floors, partitions and structural features as indicated on the contract drawings. Individual

pipes and conduit 2-in. or less in diameter that will be field routed need not be shown on coordination drawings.

e. Coordination drawings shall include large-scale details as well as cross and longitudinal sections as required to fully delineate all conditions. Particular attention shall be given to the location, size, and clearance dimensions of equipment items, shafts, operators and necessary maintenance access.

f. Make all minor changes in duct, pipe, or conduit routings that do not affect the intended function, but items may not be resized, exposed, or relocated without the approval of the Owner. No changes shall be made in any wall locations, ceiling heights, door swings or locations, window or other openings or other features affecting the function or aesthetic effect of the building. If conflicts or interferences cannot be resolved, the Owner shall be notified. Any problems of coordination that require architectural or structural changes of design shall be submitted to the Owner for resolution.

g. After the reproducible drawings have been coordinated and all changes have been made, the drawings shall be signed by the Contractor and all subcontractors indicating that all work on that drawing has been coordinated with all associated vendors and subcontractors and all conflicts have been resolved.

h. Relocation of any duct, pipe, conduit or other material that has been installed without proper coordination among all trades shall be performed at no additional cost to the Owner.

7. Written notification of any deviations from the requirements of this specification.

8. Support documentation and justification as specified.

9. Certificates of Design signed by a Registered Professional Engineer for all pipe supports. See Section 01300 for form.

1.05 QUALITY ASSURANCE

A. Pipe supports: All supports and parts shall conform to the latest requirements of the Code for Pressure Piping ASME/ANSI B31.1 and Manufactures Standardization Society (MSS) Standard Practice SP-58, SP-69, SP-89 and SP-90 except as supplemented or modified by the requirements of this specification.

B. Structural Concrete: Conform to the requirements of Section 03300. Concrete strength: 4,000 PSI unless noted otherwise.

C. Conform to the requirements of the latest edition of the AISC Manual of Steel Construction for miscellaneous and supplementary steel. Tube steels are ASTM A500 Grade B, structural shapes A36, plates A-572 or equal. Stainless steel structural members shall conform to ASTM requirement Type 316L.

D. Pipe Support Manufacturer Qualifications:

1. Must possess a written quality assurance program.
2. Have a minimum of 5 years of experience in the design and fabrication of pipe supports.
3. Have completed the design and fabrication of at least 5 successful pipe support projects of equal size, complexity, and systems as this project within the past 10 years.
4. Retains the services of a Registered Professional Engineer, registered in the state where this project is being constructed, with a minimum of ten years' experience in the design of piping systems and pipe supports.
5. Manufacturers' Standardization Society (MSS) Member.
6. Have a field service technician on staff with at least 5 years of experience in resolving field installation, interference and interface problems associated with the design, installation and manufacture of pipe supporting components. Hanger inspections shall be performed in accordance with MSS-SP-89 and ASME 31.1.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Shipping:

1. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.

B. Receiving:

1. Inspection and inventory items upon delivery to site.

2. Store and safeguard material in accordance with manufacturers' written instructions.

1.08 SPECIAL REQUIREMENTS

A. Refer to applicable specification sections of Division 1 and provide the following.

1. Foundations, Installations and Grouting.

2. Bolts, Anchor Bolts, and Nuts.

3. Sleeves and inserts.

4. Protection against electrolysis.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Carpenter & Paterson.

B. Grinnell Corporation.

C. Basic Engineers Inc.

D. Or equal.

2.02 MATERIALS:

A. Provide materials used in pipe supports, which are compatible with the pipes to which they are attached. Provide Type 316L stainless steel supports for all stainless-steel piping. Copper plated pipe supports are not acceptable.

B. Allowable materials: As indicated in ANSI B31.1 Appendix A and MSS-SP-58 Table 2.

C. Provide Type 316L stainless steel for pipe supports, hangers, guides, restraints, and anchors that are exterior or interior submerged, in potentially wetted areas in wet wells, channels, screening and grit removal areas and in chemically corrosive atmospheres.

D. Provide only new material. Previously used and/or scrap material is not acceptable.

E. Provide tube steels that are ASTM A500 Grade B, Structural shapes A-36, platesbA-572 or equal.

F. Provide sliding Teflon plates as required. The sliding surfaces shall be a nominal 3/8 in. glass filled Teflon bonded to stainless steel backup plate with a 10-gauge minimum thickness. The bearing pad upper and lower units shall be

as follows: Conslide Type CSA elements as manufactured by Con-Serv. Inc.,Balco TFE Slide Bearing Plates 10N-cs as manufactured by Balco Inc., or Dynalon Slide Bearings as manufactured by JVI, Inc. or acceptable equivalent product.

G. The blended TFE material used for this bearing shall be composed of virgin(unreprocessed) TFE resin tested per ASTM D1457 and reinforcing agents milled glass fibers. This structural material shall have the following representative mechanical and physical properties:

1. Tensile strength - 2,000 psi

2. Elongation - 225%

3. Specific Gravity - 2.17 to 2.22

4. The coefficient of friction shall average 0.06 under compressive load of 2,000 psi.

5. The compressive creep shall be a minimum of 2% at 2,000 psi and 70 degrees F.

6. The elements shall be flat, clean and prepared for installation in the structure. Slots and holes shall be fabricated in the bearing manufacturer's plant.

H. Concrete anchor bolts - Hilti Kwik-Bolt II Stud Anchors, Rawl Bolt, Phillips Wedge Anchors, or equal.

2.03 DESIGN, LOCATION, AND TYPE OF PIPE SUPPORTS

A. Design and provide pipe supports for piping ½ in. and larger to include the following loads:

1. Gravity Force: This force includes the weight of pipe, pipe contents (hydro load as required), valves, in-line equipment, insulation and any other weight imposed on the piping and/or pipe support.

2. Thermal Expansion Force: This force is developed by the restraint of free end displacement of the piping due to thermal growth.

3. Hydrostatic/Dynamic Forces: These forces are developed due to the internal pressure (positive and negative) during operation of the piping system. These forces include the forces due to water hammer, pressure pulses due to rapid valve closure, fluid discharge resulting from pump startup, operation of positive displacement pumps, etc.

B. Provide supports, guides, anchors, flexible couplings and expansion joints in accordance with the coupling and joint manufacturers' specifications and requirements.

C. Where possible, provide pipe supports, which are the manufacturers' standard products.

1. Provide pipe supports with individual means of adjustment for alignment.

2. Furnish pipe supports complete with appurtenances including locking and adjusting nuts.

3. Hanger rods shall be subjected to tension only.

4. Where lateral or axial pipe movement occurs, provide hangers for the necessary swing without exceeding 4 degrees. Provide base supports designed using pipe slides. The bearing surfaces: 0.06 coefficient of friction or less.

5. Provide concrete inserts capable of supporting the design loads.

6. Metal framing systems will be acceptable to support piping 2 in. and smaller.

7. Provide insulated piping supported using rigid load bearing insulation (baton board type) with 16-gauge shields to fit between the insulation and the support. Shields to encompass a minimum 1/3 of the pipe circumference and be 12 in. in length.

8. Provide load-bearing insulation capable of supporting the load, as a minimum on the bottom 60 degrees of the pipe support. Cope insulation and adjust to avoid interference of steel structures.

9. Provide supplementary steel as needed.

10. Do not support pipes from other pipe, conduits or metal stairs.

11. Chain, strap, T-bar, perforated bar and/or wire hangers are not acceptable.

12. Contact between piping and dissimilar metals such as hangers, building structural work or equipment subject to galvanic action is not acceptable.

13. All pipe supports located in fluid flow shall be supplied with double nutting.

D. Provide thrust anchors to resist thrust where required. Wall pipes may be used as thrust anchors if so designed. Welded attachments shall be of material

comparable to that of the piping and designed in accordance with governing codes.

E. Provide expansion joints where indicated and where required based on Contractor's design of the pipe support system. Indicate expansion joints on submittal drawings.

F. Pipe supports connected to structural framing and slabs are subject to the following limitations:

1. Less than 100 lb horizontal load per support.

2. Vertical loads not to exceed an average of 25 P.S.F. for slabs, with a maximum vertical load per hanger of 1000 lbs.

3. For a maximum of one pipe support per foot of slab width perpendicular to the span.

4. Vertical loads not to exceed 3,000 lbs. per column or 3,000 lbs. per support at walls.

5. Piping not supported from floors by metal framing must meet the limitations as specified above.

G. All outside above ground supports shall be Type 316L stainless steel as specified in paragraph 2.02(C).

H. Provide pipe supports that do not overload or over stress the piping, equipment, or structure that they are supporting or to which they are attached. Allowable pipe stress to be within ANSI B31.1 code allowable.

I. The Contractor shall provide the services of a field service technician (preferably from the pipe support manufacturer) to field coordinate the locations of supports and resolve interferences and conflicts encountered during installation.

2.04 FABRICATION

A. Provide pipe supports formed in accordance with paragraph 5.1 of MSS-SP-58.

B. Providing welding in accordance with Structural Welding Code.

C. Provide dimensional tolerances as specified in MSS-SP-89.

D. Provide threading and tapping in accordance with MSS-SP-89.

2.05 SHOP PAINTING

A. Primer and Finish Paint: Shop apply to all exterior ferrous surfaces.

B. Color: As specified for piping system of same service or as selected by the Engineer.

C. Provide similar additional paint for touch-up after installation.

D. Surface preparation, mixing and application and safety requirements shall be in accordance with the paint manufacturer's printed instructions.

E. Ferrous surfaces which are not to be painted shall be given a shop applied coat of grease or rust resistant coating.

PART 3 - EXECUTION

3.01 GENERAL

A. Install items in accordance with manufacturers' printed instructions and as indicated and specified herein.

B. Perform welding in accordance with Structural Welding Code:

1. Visually inspect welding while the operators are making the welds and again after the work is completed in accordance with AWS D1.1 Section 6.0. After the welding is completed, hand or power wire brush welds, and clean them before the Qualified Inspector makes the check inspection. The Qualified Inspector shall inspect welds with magnifiers under light for surface cracking, porosity, and slag inclusions; excessive roughness; unfilled craters; gas pockets; undercuts; overlaps; size and insufficient throat and concavity. The Qualified Inspector shall inspect the preparation of grove welds for throat opening and for snug positioning for back-up bars.

2. Nondestructive evaluation of welds connecting structural steel members subjected to critical stresses: Perform in accordance with the weld quality and standards of acceptance in AWS D1.1.

3. Magnetic Particle Inspection: Perform in accordance with ASTM E 709.

4. Liquid Penetrant Inspection: Perform in accordance with ASTM E 165.

5. For weld areas containing defects exceeding the standards of acceptance in accordance with AWS D1.1, Section 3.7. Provide additional testing of the repaired area at no additional cost to the Owner.

6. Test Locations: As selected by the Owner. (Specify minimum of pipes per number of welds and welds linear footage.)

7. Correct any deficiencies detected as directed by the Engineer at no additional cost to the Owner.

C. Proceed with the installation of the pipe supports only after required building structural work has been completed and concrete support structure has reached its 28-day compressive strength as specified in Section 03310, Cast-In-Place Concrete.

D. Install pipe supports to comply with MSS-SP-89. Group parallel runs of horizontal piping to be supported together on trapeze type hangers.

E. Install pipe supports to provide indicated pipe slopes. Do not exceed maximum pipe deflection allowed by ANSI B31.1.

F. For exposed continuous pipe runs, install pipe supports of same type and style as installed for adjacent similar piping.

G. Install pipe supports to allow controlled movement of piping systems. Permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Piping to be free to move when it expands or contracts except where fixed anchors are indicated or as required by the Contractor's pipe support systems. Where hanger rod swing length cannot be provided or where pipe movement based on expansion of 1 in/ 100 ft, for each 100 deg. F change in temperature exceed ½ in., provide sliding supports.

I. Prevent contact between dissimilar metals. Where concrete or metal support is used, place 1/8 in. thick Teflon, neoprene rubber, or plastic strip under piping at point of bearing. Cut to fit entire area of contact between pipe and pipe support.

J. Prevent electrolysis in support of copper tubing by use of pipe supports which are plastic coated. Electrician's tape is not an acceptable isolation method.

K. Apply an anti-seize compound to nuts and bolts on all pipe supports.

L. Locate reinforcing steel in concrete structure with x-ray prior to drilling for embedment plates and anchor bolts. Avoid contact or interference with reinforcing steel.

3.02 INSTALLATION OF BUILDING ATTACHMENTS

A. Support piping from structural framing, unless otherwise indicated.

B. Concrete Inserts:

1. Use existing embedded concrete items whenever possible.

2. Use expansion anchors only when existing embedded attachment points are not available or unsuitable. Attach to hardened concrete or completed masonry.

3.03 THRUST ANCHORS AND GUIDES

A. Thrust Anchors:

1. Center thrust anchors between expansion joints and between elbows and expansion joints for suspended piping. Anchors must hold pipe rigid to force expansion and contraction movement to take place at expansion joints and/or elbows and to preclude separation of joints.

2. Restraining rod size and number shall be as indicated and adhere to manufacturers recommendations as a minimum.

B. Pipe guides: Provide adjacent to sliding expansion joints in accordance with recommendations of the National Association of Expansion Joint Manufacturers and the specific joint manufacturer.

3.04 PIPE SUPPORTS

A. Where piping of various sizes is to be supported together, space supports for the largest pipe size and install intermediate supports for smaller diameter pipes.

B. Provide minimum of two pipe supports for each pipe piece unless approved by Engineer.

C. Where pipe connects to equipment, support pipe independently from the equipment. Do not use equipment to support piping.

D. Provide pipe supports so that there is no interference with maintenance or removal of equipment.

E. Unless otherwise indicated or authorized by the Engineer, place piping running parallel to walls approximately 1-1/2 in. out from face of wall and at least 3 in. below ceiling.

F. Pedestal pipe supports: adjustable with stanchion, saddle, and anchoring flange. Provide grout between baseplate and floor.

G. Piping supports for vertical piping passing through floor sleeves: use hot dipped galvanized steel riser clamps.

H. Support piping to prevent strain on valves, fittings, and equipment. Provide pipe supports at changes in direction or elevation, adjacent to flexible couplings, adjacent to non-rigid joints, and where otherwise indicated. Do not install pipe supports in equipment access areas or bridge crane runs.

I. Stacked horizontal runs of piping along walls may be supported by metal framing system attached to concrete insert channels.

J. Do not support piping from other piping.

K. Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized whenever possible.

L. Whenever possible, pipe attachments for horizontal piping shall be pipe clamps.

M. All rigid rod hangers shall provide a means of vertical adjustment after erection.

N. Where the piping system is subjected to shock loads, such as disturbances due to pump discharge or thrust due to actuation of safety valves, hanger design shall include provisions for rigid restraints or shock absorbing devices.

O. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated suitable linkage shall be provided to permit rod swing.

P. Hanger spacing shall not exceed the spacing listed below:

1. In the case of concentrated loads, the supports shall be placed as close as possible to the load to reduce the bending stress.
2. Where changes in direction of the piping system occur between supports, the total length between supports shall be kept to less than three-fourths of the full span. When practical, a support shall be placed immediately adjacent to any change in direction of the piping system.

Q. Where practical, riser piping shall be supported independently of the connected horizontal piping. Pipe support attachments to the riser piping shall be riser clamp shear lugs. Welded attachments shall be of material comparable to that of the piping and designed in accordance with governing codes. If friction is relied upon to support riser piping, proper justification and documentation shall

be submitted to ensure that enough friction force is provided to resist the applied loading.

R. Hanger components shall not be used for purposes other than for which they were designed. They shall not be used for rigging and erection purposes.

S. All threads shall be UNC unless otherwise specified.

T. TFE slide bearing plates with steel backup plates shall be stitch weld attachments to the structure. A 1/8 in. fillet weld, ½ in. long every 3 inches on center each side of an element shall be used unless otherwise indicated or specified by the manufacturers' written recommendations. Bearing elements with slots or holes shall be stitch welded in place for location. The TFE surfaces of the bearings shall be maintained clean and free from grit, dirt or grease.

3.05 INSULATED PIPING

A. Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed allowable pipe stresses.

B. Where vapor barriers are indicated on water piping, install coated protective shields.

END OF SECTION 15056

SECTION 15100

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 Scope

A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.

B. Items included under this Section are:

1. Gate Valves

2. Check Valves

3. Plug Valves

1.02 Description of Systems

A. All the equipment and materials specified herein are intended to be standard for use in controlling the flow of water.

B. (Not Used)

1.03 Quality Assurance

A. Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or otherwise specified.

1. ANSI/AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service

2. ANSI/AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.

3. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

4. ANSI/NSF Standard 61 – Drinking Water System Components – Health Effects

5. AWWA C508-159 – Lever-and-weight Swing Check Valves

1.04 Submittals

A. Submittals shall be in compliance with the requirements of Section 01300 Submittal Procedures. In addition, the following specific information shall be provided:

1. Complete shop drawings of all valves and appurtenances

2. Manufacturer's certificate certifying that the products meet or exceed the specified requirements.

B. (Not Used)

1.05 Tools

A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

B. (Not Used)

PART 2 - PRODUCTS

2.01 Materials and Equipment

A. All valves and appurtenances shall be of the size shown on the Drawings and all equipment of the same type shall be from one manufacturer.

B. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

2.02 Gate Valves

A. Gate valves shall be resilient seated type conforming to the requirements of AWWA C509 or AWWA C515.

B. Valves shall have a minimum working pressure of 250 psi.

C. Valve manufacturer shall submit an affidavit to the Engineer indicating valve compliance with all applicable AWWA standards.

D. Valves shall be flanged or as shown on the Drawings.

E. Valve shall be non-rising stem type with a 2-inch square operating nut and shall open left (counter-clockwise).
F. All internal and external ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall conform to ANSI/AWWA C550 and shall be applied electrostatically prior to assembly. Epoxy shall be NSF61 approved.

G. Valve shall have a ductile iron body, bonnet and stuffing box. All joints between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be supplied with o-ring seals.

H. Valve wedges shall be symmetrical, made of ductile iron and totally encapsulated in rubber. Rubber shall be permanently bonded to the wedge per ASTM D429.

I. Valves shall be manufactured by American Flow Control, Mueller, M & H Valve, or pre-approved equal.

2.03 Swing Check Valves

A. Class 150 Valves:

1. Check valves shall be lever-and-weight type conforming to the requirements of AWWA C508-09.

2. Valve bodies shall be ductile iron conforming to ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron.

3. Valve ends shall be flanged as shown on the Drawings

B. Flange joints shall meet the requirements of ANSI B16.1, Class 125.

C. Check valves shall be manufactured by M&H, Mueller or pre-approved equal.

2.04 Plug Valves

A. Plug valves shall be eccentric plug valves of rectangular port construction with resilient faced cylindrical plugs eccentrically offset from the seat, for the purpose of providing isolation or throttling control as indicated.

B. Plugs shall be solid one piece, Cast Iron ASTM A126 Class B or Ductile Iron ASTM 536 Grade 65-45-12. The plug shall have a cylindrical seating surface eccentrically offset from the center of the shaft. Plug shall not contact the seat until at least 90% closed. Resilient plug facing shall be Chloroprene (CR). Spherical shaped plugs are not acceptable.

C. Bodies shall be Cast Iron ASTM A126 Class B. Ports shall be rectangular. Round ports are not acceptable. Bearings shall be sleeve type and made of sintered, oil impregnated permanently lubricated type 316 stainless steel, ASTM A743 Grade CF8M through 36” (900mm). In valves larger than 36” (900mm), the upper and lower plug journals shall be fitted with ASTM A240 Type 316 stainless sleeves with body bearings of ASTM B30, Alloy C95400 aluminum bronze. Lay length shall match the lay length of the existing plug valve.

D. Seats on shall be 1/8” thick welded overlay of not less than 95% pure nickel. Seat shall be at least 1/2” wide and 1/8” thick through entire width and raised. The raised surface shall be completely covered with nickel to ensure that the resilient plug face contacts only the nickel seat.

E. Adjustable packing shall be Acrylonitrile-Butadiene (NBR) multiple V-ring type, with a packing gland follower. Packing gland shall permit inspection, adjustment or complete replacement of packing without disturbing any part of the valve or actuator assembly, except the gland follower. Non-adjustable packing or packing requiring actuator removal to replace the packing, are not acceptable.

F. Pressure ratings shall be 150 psi (1035kPa) for 14" (350mm) and larger. Every valve shall be given a certified hydrostatic shell test and seat test, with test reports being available upon request.

G. Design pressure ratings shall be 150 psi and provide tight shutoff against flow in two directions.

H. With the valve in the closed position, the valve shall be bubble tight at rated pressure.

I. All valves shall be as manufactured by the DeZURIK, Pratt or pre-approved equal.

J. Plug valve shall be compatible with the existing Beck actuator without modification to the existing actuator.

2.05 Extension Stems

A. All valves shall be furnished with extension stems if operating nut is greater than four feet below operating level, to bring the operating nut to within 24-inches of the top of the operating level. 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 stainless steel and shall be furnished by the valve manufacturer. Extension stems shall be sized by the valve manufacturer to withstand the maximum valve operator output.

B. Stem guides shall be fully adjustable stem guides with bronze bushings and shall be furnished by the valve manufacturer. Stem guides shall be installed as shown on the Drawings and shall conform to the extension guide spacing requirements as specified in AWWA/ANSI C501.

2.05 Wrenches

A. Four tee handled wrenches of suitable length shall be furnished to operate all valves.

B. (Not Used)

PART 3 - EXECUTION

3.01 Installation

A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

B. Prior to installation, valves shall be inspected for direction of opening counterclockwise, 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 corrected or held for inspection by the Engineer. Valves shall be closed before being installed.

3.02 Laying and Jointing Valves and Appurtenances

A. Valves, fittings, plugs, and caps shall be set and joined to the pipe in accordance with the manufacturer’s recommendations for cleaning, laying and joining pipe.

B. 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.

C. Underground valves shall be installed in vaults where indicated on the Drawings. The vault shall be precast or cast-in-place concrete as indicated on the Drawings. The valve box shall not transmit shock or stress to the valve and shall be as detailed on the Drawings. The valve vault cover shall be flush

with the surface of the finished area or such other level as directed by the Engineer.

D. Settlement Joints: The first joint on all pipe connected to and outside of a valve vault shall be designed to allow differential settlement. Ductile iron pipe shall use standard gasketed joints if unrestrained, or mechanically restrained gasketed joints if required by thrust restraint design.

3.03 Testing

A. After installation, all valves and appurtenances shall be tested at least 1 hour at 250 psi, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the Engineer.

END OF SECTION

SECTION 16000

ELECTRICAL POWER AND SYSTEMS

PART 1 - GENERAL

1.01 Scope

A. The electrical work commences with the point of electrical service where shown on the Drawings and includes furnishing all material and labor for a complete electrical installation.

B. The requirements of Division 1 apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.02 Definitions

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Low Voltage: 0-600 volts.

E. Indicated: Shown on the Drawings.

F. Noted: Indicated or specified elsewhere.

1.03 Material Not Furnished

A. Unless otherwise noted, the following are furnished and installed under other Divisions:

1. Motors

2. Motor starters (except motor control centers)

3. Electric heating and air conditioning equipment

4. Building energy management systems

5. Electrical heat tracing

6. Pilot and control devices for the above equipment

B. All power wiring including associated terminations is provided under this Division. Control and signal wiring shown on the electrical drawings, including associated terminations is also provided under this Division. Control wiring for mechanical equipment not shown on the electrical drawings is provided under Division 15. Where digital communications cables (fiber optic cables, RS-485 cables, etc.), are specified under Division 17, cable pulling and installation in raceways shall be provided under this Division with any required splices and all terminations provided under Division 17.

1.04 Local Conditions

A. Power will be supplied by the utility company underground distribution system. Verify and comply with all power company requirements for metering, pull sections, transformer pads. Make necessary arrangements with the power company for temporary service requirements. Have the power company review submittals on equipment containing utility metering sections.

B. Verify and comply with all requirements of the local telephone company concerning the complete telephone system.

1.05 Quality Assurance

A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.

B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies.

C. Industry Standards: Standards organizations and their abbreviations, as used herein, are as follows. Applicable date for industry standards is that in effect on the date of advertisement of the Project.

1. American National Standards Institute (ANSI)

2. American Society for Testing and Materials (ASTM)

3. Federal Specifications (FS)

4. Institute of Electrical and Electronics Engineers (IEEE)

5. Insulated Cable Engineers Association (ICEA)

6. National Electrical Manufacturers Association (NEMA)

7. National Fire Protection Association (NFPA)

8. Underwriters Laboratories, Inc. (UL)

1.06 Submittals

A. Make all submittals in accordance with the requirements of Section 01340. Approval drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned and stamped approval is not required prior to installation.

C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

1.07 Record Drawings

A. Furnish record drawings in accordance with the requirements of Section 01720. Record drawings consist of submittal data as listed above, operation and maintenance data, and as-built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.

B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) located in a hinged metal cabinet in the main electrical room and shall include:

1. Title page with project name; installing contractor's name, address and telephone number; date of installation and warranty period.

2. Index sheet.

3. Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service

organization for each item.

4. Coordination Study and written certification that devices have been set in accordance with the study.

C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.

D. Submit the results of any tests required in the individual equipment sections.

1.08 Delivery, Storage, and Handling

A. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.

B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

PART 2 - PRODUCTS

2.01 Materials

Provide only new products of the manufacturer's latest design.

2.02 Substitutions

Where the words "equal to" follow or precede the listed acceptable manufacturers, equal products of other manufacturers are acceptable and request for substitution may be made during submittal stage.

PART 3 - EXECUTION

3.01 Installation

A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall

be submitted immediately for the Engineer's consideration.

C. Do not stub up conduits prior to receipt of approved shop drawings showing conduit entry locations.

D. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

3.02 Certification and Tests

A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.

C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 Scope

This Section includes basic materials and methods common to all Sections of Division 16.

1.02 Submittals

Submit product data.

PART 2 - PRODUCTS

2.01 Wiring Devices

A. Convenience Receptacles: NEMA WD 1; FS W C 596; 15 amp, 125 volt, specification grade; impact resistant nylon face; back and side wiring provisions; grounding screw. Where CR or NEMA 4X is indicated, provide corrosion resistant receptacle, yellow nylon body, one-piece brass contacts. Exception: Provide 5-20R receptacles for branch circuits serving one device.

B. Receptacle, Ground Fault Interrupter: Duplex, specification grade, tripping at 5-milliamps; 125-volt, configuration 5-20R unless otherwise noted on drawings.

C. Device Colors: Gray, unless otherwise selected by the Architect for specific use devices.

H. Outdoor Weatherproof (NEMA 3R and NEMA 4X) Cover Plates: Stainless steel, specification grade, gasketed equal to Sierra WP Series. For heat tape, instruments, or other devices which are continuously plugged in, provide die cast aluminum, suitable for wet locations while in use, equal to Hubbell WP26.

2.02 Disconnect Switches

A. Disconnect Switches: UL-98 and NEMA KS-1; heavy duty, quick make, quick break type; horsepower and i2t rated. Provide lever type operating handle directly connected to the switch mechanism; rocker types are not acceptable. Include padlocking provisions and nameplate clearly indicating “ON” and “OFF” positions. Equip all switches with a ground lug and, where neutral conductors are scheduled, provide insulated neutral lugs.

B. Fusible Switches: Equip with rejection clips for fuse types noted.

C. Enclosure: Stainless steel meeting NEMA 4X and 12 requirements.

D. Acceptable Manufacturers: Cutler-Hammer, General Electric, Square D or Siemens.

E. Hazardous Areas: Where Division 1 or 2 classified areas are indicated, provide switches equal to Crouse-Hinds type FLS.

2.03 Control Stations

A. Pushbuttons, Selectors and Pilot Lights: 600 volt, heavy duty, factory sealed.

B. Enclosure: Stainless steel meeting NEMA 4X and NEC Class I, Division 2, Group C and D requirements.

C. Acceptable Manufacturers: Equal to Allen-Bradley Bulletin 800T.

D. Hazardous Areas: Where Division 1 classified areas are indicated, provide control stations equal to Crouse-Hinds EFS/EFD series.

2.04 Individual Surge Suppressors

A. Surge Suppressor: Listed in accordance with UL 1449, Second Edition and UL 1283. Device shall provide surge current diversion paths for 120 VAC circuit application; L-N, L-G, and N-G. Device shall be fused with a surge rated fuse and incorporate a thermal cutout device. An audible alarm shall indicate protection failure. Minimum surge current capability shall be 50 kA.

B. Enclosure: NEMA 4X stainless steel.

C. Acceptable Manufacturers: Equal to Liebert, Current Technology or Innovative Technology (suppressor) and Hoffman (enclosure).

2.05 Fuses

A. Fuses: Current limiting, non-renewable type, rated 200,000 AIC, with rejection feature; Class J or as required by load for ratings 600 amp and below and Class L for ratings 601 amp and above.

B. Acceptable Manufacturers: Bussmann, Chase-Shawmut, or Littelfuse.

2.06 Supporting Devices

A. Support Channel: Stainless steel.

B. Hardware: Stainless steel.

2.07 Electrical Identification

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

B. Wire and Cable Markers: Plastic, split sleeve or tubing type.

PART 3 - EXECUTION

3.01 Wiring Devices

A. Secure devices to outlet boxes without depending on device plates to pull them tight. Install a bonding jumper between all devices and outlet boxes. Install receptacles with ground pole down.

B. For cord and plug connected equipment, coordinate receptacle configuration with equipment supplied.

3.02 Disconnect Switches

A. Provide switches with voltage, ampere, and number of poles as indicated on the Drawings.

B. Switches are non-fused type, unless Drawings note otherwise, or the switch is used as a disconnect for an item of equipment with a maximum fuse size designated on the nameplate. In such cases, provide fusible type with appropriate fuse. If fusible switches protect conductors with an ampacity less than the rating of the switch, provide a nameplate on the inside front cover of the switch designating the maximum allowable fusing.

C. Install switches so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the switch secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

D. For disconnect switches serving motors with space heaters, provide lamecoid nameplate engraved “WARNING – Motor space heater energized with switch open”.

3.03 Individual Motor Starters

A. Select and install heater elements in motor starters to match installed motor characteristics. Do not use NEC motor full load ampere data for heater

selection.

B. Provide a typed label inside each motor starter enclosure door identifying the motor served and listing the motor nameplate data. Provide an engraved nameplate on the exterior of the enclosure door identifying the motor served, the horsepower, voltage and phase rating.

C. Install starters so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the starter secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

3.04 Contactors

A. Install timer and lighting controls for contactors as indicated.

B. Install indicator lights in enclosure door as indicated.

3.05 Control Stations

Install control stations so they are rigidly supported and located so as not to impair access to equipment for maintenance.

3.06 Individual Surge Suppressors

Install suppressors so they are rigidly supported and accessible.

3.07 Fuses

Equip all fusible devices with fuses. Replace all blown fuses up to final acceptance of the Project. At the completion of the Project, turn over to the Owner spare fuses for each type and size installed; six each for ratings 60 amps and below, and three each for ratings above 60 amps.

3.09 Supporting Devices

A. Fasten hanger rods, support stands, conduit clamps, etc. to building structure using expansion anchors or beam clamps.

B. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit. Do not use powder actuated fastening devices. Do not drill structural steel members.

3.10 Electrical Identification

Provide nameplates for all switchboards, panhelboards, transformers, disconnect switches, individual motor starters, and other items of electrical distribution equipment. Engrave with the equipment identification as indicated, and the voltage, current and interrupting rating. Attach nameplates with screws or rivets; adhesives are not acceptable. Exception: Two-part epoxy glue may be used for NEMA 4/4X enclosures.

END OF SECTION

SECTION 16111

CONDUITS

PART 1 - GENERAL

1.01 Scope

A. Rigid metal conduit and fittings.

B. Intermediate metal conduit and fittings.

C. Flexible metal conduit and fittings.

D. Liquidtight flexible metal conduit and fittings.

E. Non-metallic conduit and fittings.

F. Electrical metallic tubing and fittings.

1.02 Submittals

Do not submit equipment specified in this Section.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

A. Conduit: Allied, Republic, Triangle or Wheatland.

B. PVC Coated Conduit and Fittings: Ocal, Permacote or Robroy.

C. PVC Conduit: Amoco, Carlon or Certainteed.

D. Flexible Conduit: Anaconda, Thomas & Betts, Electric Flex or Triangle.

E. Fittings: Appleton, Crouse-Hinds, Oz or Thomas & Betts.

F. Nonmetallic Flexible Conduit and Fittings: Carlon Carflex.

G. Substitutions: Products equal to those listed.

2.02 Rigid Metal Conduit and Fittings

A. Rigid Steel Conduit: UL 6; ANSI C80.1; hot dip galvanized; minimum size 3/4-inch.

B. Rigid Aluminum Conduit: UL 6; ANSI C80.5; minimum size 3/4-inch.

C. PVC Coated Conduit: NEMA RN-1 or UL-6 rigid steel conduit with factory applied external 40 mil PVC coating and urethane interior coating. Prior to coating, treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4-inch.

D. Fittings and Conduit Bodies: NEMA FB-1; zinc coated; taper-threaded type, material to match conduit. Where PVC coated conduits are indicated all couplings, fittings, conduit bodies, pipe straps, U bolts, beam clamps, flex connections and other accessories shall be stainless steel or shall have factory applied PVC coating. Use PVC coated hubs for connection of coated conduits - locknuts are not acceptable.

2.03 Intermediate Metal Conduit (IMC) and Fittings

A. IMC: UL 1242; hot dip galvanized; minimum size 3/4-inch.

B. Fittings and Conduit Bodies: Use fittings and conduit bodies specified above for rigid steel conduit.

2.04 Flexible Metal Conduit and Fittings

A. Conduit: UL 1; FS WW-C-566; single steel continuous strip with galvanized coating; minimum size 3/8-inch.

B. Fittings and Conduit Bodies: NEMA FB-1; malleable iron squeeze type.

2.05 Liquidtight Flexible Conduit and Fittings

A. Conduit: UL listed liquidtight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch. Exception: Where connected to devices with manufacturer supplied 1/2 or 3/8-inch hubs, match conduit size to hub size.

B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with O-ring. Where PVC coated conduits are indicated, provide PVC coated fittings for flex connections.

2.06 Rigid Nonmetallic Conduit and Fittings

A. Conduit: NEMA TC-2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC-3.

2.07 Liquidtight Flexible Non-Metallic Conduit and Fittings

A. Conduit: UL listed, liquidtight consisting of a hand PVC spiral with flexible PVC covering. Minimum size is 3/4-inch.

B. Fittings: UL listed, molded from high-strength, glass-filled thermoplastic.

2.08 Electrical Metallic Tubing (EMT) and Fittings

A. EMT: ANSI C80.3; hot dip galvanized mild strip steel; minimum size 1/2-inch.

B. Fittings and Conduit Bodies: NEMA FB-1; steel or malleable iron, compression type with insulated throat. Indenter or set screw type connectors are not acceptable.

PART 3 - EXECUTION

3.01 Conduit Schedule

A. Except as noted, use only rigid steel or IMC conduits.

B. Use liquidtight flexible steel conduit for connections to motors, transformers, and other vibrating equipment. Maximum length is 3 feet unless approved by the Engineer.

C. EMT may be used where concealed in spaces above hung ceilings and in hollow spaces of interior partitions.

D. Non-jacketed flexible steel conduit may be used for connections to lighting fixtures in suspended ceilings.

E. Use PVC coated conduits where conduits are in direct contact with earth. Provide 24 inches minimum cover.

F. Rigid nonmetallic conduit may be used for underground concrete encased duct banks and in or below slab on grade. Exception: Use rigid steel or IMC conduit for analog signal circuits; 4 to 20 mA and AC or DC signals less than 25 volts.

G. Where PVC conduit is indicated, make a transition to rigid steel below grade or slab and continue above with rigid steel conduit. Exception: PVC may enter switchboards, motor control centers or other floor standing electrical equipment enclosures. Provide bell ends or socket end bell at enclosure entry.

H. Where aluminum conduit is indicated, conduit may not be installed in direct contact with concrete or masonry surfaces.

3.02 Conduit Arrangement and Support

A. Arrange conduit to maintain headroom and present a neat appearance. Run exposed conduits parallel or perpendicular to building surfaces and adjacent piping. Group conduit in parallel runs where practical and provide rack space for 25 percent additional conduits. Use concentric bends for parallel runs.

B. Avoid sources of heat when possible. Where unavoidable, maintain 3-inch clearance when crossing hot pipes and 12-inch clearance between parallel hot pipes, flues, heating appliances and other heat sources.

C. Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one-hole malleable iron straps. For multiple runs use channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

D. Support conduit at a maximum of seven feet on center and within three feet of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8-inch diameter. Remove all temporary supports prior to pulling conductors.

E. Do not support conduits from electrical distribution equipment or control panels.

3.03 Conduit Installation

A. Cut conduit square using a saw or pipecutter and de-burr cut ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.

B. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use "LBD" or similar fittings to permit a straight pull from either direction. In no case shall a fitting be used which results in bending radius too small for the cable.

C. The maximum length between pull points is 400 feet. This length shall be reduced by one foot for each degree of bend.

D. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size. Crushed or deformed conduits may not be installed.

E. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.

G. Provide a 200 pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.

H. Install expansion joints equal to Crouse Hinds type XJ where conduit crosses building expansion joints and for straight runs in excess of 100 feet. For seismic joints use expansion joints equal to Crouse Hinds type XD.

I. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.

J. Provide watertight seals, equal to OZ type WSK, FSK, or CSM, where conduit penetrates exterior walls and where conduit passes between spaces normally at different temperatures. Seal duct bank and underground conduit entry with GE or Dow silicone sealant. Stub duct bank and underground conduits up a minimum of 2-inches above equipment pads and provide bushing.

K. Obtain approved shop Drawings showing conduit entry space before stubbing conduits in floor standing electrical gear.

L. In locations where the conduit cannot be turned, provide three piece threaded rigid couplings.

M. Provide clamp backs for conduits on exterior or damp surfaces to prevent the raceway from bearing directly on the damp surface.

N. Route conduits in slabs above grade above the bottom reinforcing and below the top reinforcing. Maximum size for conduits in slabs above grade is 1-inch and minimum cover is 2-inches. Route so conduits in slabs above grade do not cross. For slab on grade route conduits in a trench below slab at sufficient depth to permit vertical exit from slab. Home runs shall not be routed in slabs except where indicated.

O. Protect conduit threads from rust and damage during construction.

P. PVC Conduit Bends: Do not use methods which will deform or change the physical characteristics of the conduit. Use PVC-coated rigid steel factory elbows for bends in runs longer than 100 feet, and in runs which have more than two bends, regardless of length. Exception: Where concrete encased in slab or ductbank, GRS elbows may be used in lieu of PVC coated.

Q. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20

minutes minimum.

R. PVC Coated Conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like. Nicks or small damaged areas (1/2-inch maximum) may be repaired with a manufacturer approved compound. Replace items if coating is damaged in excess of 1/2-inch. Fill space between PVC coating and reducing fittings with silicone sealant.

S. Conductor Protection: Provide bushings on metallic and bell ends on PVC conduits unless conduit terminates in a hub or similar fitting.

3.04 Underground Duct Bank Installation

A. Install top of duct bank minimum 18-inches below finished grade with plastic warning tape 12-inches below finished grade.

B. Install conduit with minimum grade of 4-inches per 100 feet.

C. Terminate conduit in end bell at manhole entries.

D. Stagger conduit joints in concrete encasement 6-inches minimum.

E. Provide minimum 3-inch concrete cover at bottom, top, and sides of duct bank. Use suitable separators and chairs installed not greater than four feet on centers to provide conduit spacing as indicated. Securely anchor conduit to prevent movement during concrete placement.

F. Construct duct banks with 3,000 psi concrete. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

G. Where duct bank passes beneath footings or slabs resting on grade excavate to provide a minimum of 6-inch clearance between the conduits and the structure. Backfill to the base of the structure with concrete.

END OF SECTION

SECTION 16120

WIRE AND CABLE

PART 1 - GENERAL

1.01 Scope

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.02 Submittals

A. Submit product data.

B. Submit test results as listed in Part 3.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

A. Low Voltage Conductors: Equal to Aetna, American, Cablec, Continental, Okonite, Pirelli, Southwire or Triangle.

B. Signal Circuit Conductors: Equal to Belden, Continental, Dekoron or Penn.

C. Low Voltage Connectors: Equal to Burndy, Thomas & Betts, Ideal or OZ.

D. Pulling Compounds: Water soluble, equal to Polywater J.

E. Wire and Cable Markers: Plastic, split sleeve or tubing type, equal to Brady Type XC or T & B Type SM.

2.02 Building Wire

A. Thermoplastic Insulated Building Wire: NEMA WC-5.

B. Feeder and Branch Circuits: Single conductor; 98 percent conductivity copper; 75/90 degrees C; 600 volt PVC insulated with nylon jacket; Type THWN/THHN for sizes #1 AWG and smaller. Sizes larger than #1 AWG are XLP insulation type XHHW. Minimum size #12 AWG.

C. Control Circuits: Same as specified above for feeder and branch circuits,

except minimum size #14 AWG.

2.03 VFD Cables

VFD Cables: Stranded copped conductors, 100% shielding with foil tape and copper tape, oil and chemical resistant outer jacket, specifically designed for use with variable frequency drives. Cables are 4 conductor plus 2 – No. 14 signal conductors in sizes No. 12 AWG to No. 4 AWG and 4 conductor in sizes No. 2 AWG and larger. Equal to Olflex – VFD.

2.05 Remote Control and Signal Cable

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor; 600 volt insulation, rated 60 degrees C; individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, individual conductors twisted together, shielded, and covered with a fluoropolymer jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

D. Instrumentation Signal Cables: #16 AWG stranded tinned copper conductors; 600 volt polyethylene insulation; twisted pair or three conductor construction; 100 percent coverage aluminum polyester shield; #18 stranded tinned copper drain wire; vinyl outer jacket; UL listed.

PART 3 - EXECUTION

3.01 General Wiring Methods

A. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

D. Identification: All conductors shall be identified throughout the electrical system. For control and signal conductors use wiremarkers at all terminals and connections. Color code power circuit conductors as follows:

	120/208 Volt System	277/480 Volt System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

E. For conductors larger than #6 AWG color coding may be accomplished with 1-inch wide colored tape applied at each end of the conductor or at points where conductor is accessible so as to be visible inside the enclosure.

F. Neatly train and lace wiring inside boxes, equipment and panelboards. Support to prevent conductor movement under fault conditions.

G. Provide separate pull and junction boxes to keep analog signal separate from control and power wiring.

3.02 Wiring Installation in Raceways

A. Unless otherwise indicated, install all conductors in conduit.

B. Pull all conductors into a raceway at the same time. Thoroughly swab raceway system before installing conductors. Use wire pulling lubricant for all pulls. Do not exceed the manufacturer's pulling tension.

C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

3.03 Installation in Manholes

A. Rack all cables; straight thru pulls are not acceptable.

B. Secure cables to rack supports with tie wraps to prevent motion under fault conditions.

C. Provide a minimum of 6 feet slack for all high voltage cables. Do not splice high voltage cables without approval by the Engineer.

3.04 Wiring Connections and Terminations

A. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.

B. Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs.

C. Use mechanical connectors for splices, taps, fixture and motor connections. Exception: Square thread helical spring plastic cap (wire nut) type connectors are acceptable for solid conductor splices and taps. Provide adapters as required for terminations of multiple conductors.

D. Use insulated throat, spade type crimp on connectors for strap screw device terminals. Exception: Receptacle back wiring provisions may be used for terminating solid conductors.

E. Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150 percent of the insulation value of conductor.

F. Thoroughly clean wires before installing lugs and connectors.

G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

3.05 Field Quality Control

A. Inspect wire and cable for physical damage and proper connection.

B. Torque test conductor connections and terminations to manufacturer's recommended values.

C. Continuity Tests: Ring all conductors for continuity and replace any open conductors.

D. Ground Fault Tests: Meggar all feeder circuits for grounds. Compile and submit a list of meggar readings. Replace all conductors measuring less than 2 megohms to ground.

END OF SECTION

SECTION 16130

BOXES

PART 1 - GENERAL

1.01 Scope

A. Outlet boxes.

B. Pull and junction boxes.

1.02 Submittals

Submit product data.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

Boxes shall be equal to Appleton, Crouse Hinds, Hoffman, Raco, or Steel City.

2.02 Outlet Boxes

A. Sheet Metal Outlet Boxes: NEMA OS-1; galvanized steel, with 1/2-inch male fixture studs where required.

B. Nonmetallic Outlet Boxes: NEMA OS-2.

C. Cast Boxes: Cast feralloy with galvanized or cadmium finish, deep type, gasketed cover, threaded hubs.

2.03 Pull and Junction Boxes

A. Sheet Metal Boxes: NEMA OS-1; galvanized steel. Boxes larger than 12-inches in any dimension are hinged enclosure as specified under Section 16160.

B. Cast Metal Boxes: NEMA 250; Type 4, galvanized cast iron box and cover, neoprene gasket, stainless steel cover screws, UL listed as raintight. Provide flat-flanged type for surface mounting and outside flange recessed cover type for underground use. Boxes for sidewalk or other traffic areas to have appropriate duty cover with non-skid finish.

C. Corrosion Resistant Boxes: UL 508, NEMA Type 4X non-metallic fiberglass

reinforced polyester, gasketed screw cover. For boxes larger than 12-inches in any dimension provide hinge on one side and stainless steel toggle latches (equal to Hoffman A-FC4-12SS) on the other three sides. Equal to Crouse Hinds Krydon type NJB.

D. Fiberglass Handholes for Underground Installations: Die-molded with pre-cut 6 x 6-inch cable entrance at center bottom of each side; fiberglass weatherproof cover with non-skid finish.

2.04 Wireways

Wireways shall be 14 gauge steel minimum, hinged cover and body, NEMA 12, grey powder finish inside and out.

PART 3 - EXECUTION

3.01 Coordination of Box Locations

A. Provide boxes as shown on Drawings, and as required for splices, taps, wire pulling, and equipment connections.

B. Box locations shown on the Drawings are approximate unless dimensioned. Verify box locations prior to rough-in. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and other furnishings. Locate outlet boxes to permit handicap access per ANSI A117.1. Any outlet may be relocated by up to 10 feet before it is permanently installed without incurring additional cost.

3.02 Installation

A. Do not install boxes back-to-back in walls. Provide minimum 6-inch separation, except provide minimum 24-inch separation in acoustic-rated walls.

B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

C. Support boxes independently of conduit. Provide knockout closures for unused openings.

D. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

E. In inaccessible ceiling areas, position outlets and junction boxes within 6-inches of recessed luminaire, to be accessible through luminaire ceiling opening.

F. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

G. Align wall-mounted outlet boxes for switches, thermostats, and similar devices. Align adjacent devices at different elevations in one vertical line. Set floor boxes level and flush with finish flooring material.

H. Unless otherwise noted, use only cast boxes. Sheet metal boxes may be used where concealed above ceilings or in dry walls, exposed in electrical closets, and for telephone wiring.

I. Field drill conduit holes in tap, junction and pull boxes so as to afford the maximum bending radius for the conductors.

J. Use PVC coated boxes wherever PVC coated conduit is indicated. Exceptions: stainless steel is permitted for boxes larger than 5 inches square.

K. Label cover of junction boxes with circuit numbers of conductors in the box.

END OF SECTION

SECTION 16160

CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 Scope

A. Hinged cover enclosures.

B. Cabinets.

C. Terminal blocks and accessories.

1.02 Submittals

A. Submit product data.

B. Shop Drawings for Equipment Panels: Include schematic diagram, wiring diagram, outline drawing and construction diagram as described in NEMA ICS-1.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

Cabinets and enclosures shall be equal to Crouse Hinds, Hoffman or Weigmann.

2.02 Hinged Cover Enclosures

A. Construction: NEMA 250; 10 gauge steel, no knockouts, wall mounted or free-standing as indicated. Free-standing enclosures are minimum 20-inches deep. Unless otherwise noted, enclosures are NEMA 1A for indoor dry locations and NEMA 4X stainless steel for outdoor, wet or damp locations.

B. Finish: Stainless steel.

C. Covers: Continuous hinge, held closed by hasp and staple for padlock. Furnish three point latch for free standing enclosures.

D. Panel for Mounting Terminal Blocks or Electrical Components: 14 gauge steel, white enamel finish.

2.03 Cabinets

A. Cabinet Boxes: Code gage galvanized steel. Provide 3/4-inch thick plywood backboard painted matte white, for mounting terminal blocks.

B. Cabinet Fronts: Steel surface type with concealed trim clamps, concealed hinge and flush lock keyed to match branch circuit panelboard; finish in gray baked enamel.

2.04 Terminal Blocks and Accessories

A. Terminal Blocks: NEMA ICS-4; UL listed.

B. Power Terminals: One-piece phenolic closed-back type, with binding screw or stud terminal connectors, rated 600 volts.

C. Signal and Control Terminals: Modular construction type, channel mounted with marking strip; screw terminals, rated 300 volts.

2.05 Fabrication

A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with NEMA ICS-6.

B. Selectors and Indicators: Door mounted for indoor enclosures. For outdoor enclosures provide a separate, hinged, inner door (dead front panel) for device mounting.

C. Lace conductors with plastic ties to present a neat and orderly appearance. Provide nylon wrapping to protect conductors crossing hinges.

D. Provide protective pocket inside front cover with control wiring and panel layout diagrams.

PART 3 - EXECUTION

3.01 Installation

A. Install cabinets and enclosures plumb, anchor securely to wall and structural supports at each corner, minimum.

B. Provide accessory feet for free-standing equipment enclosures.

C. Extend conduits directly to cabinets and panelboards without using junction boxes or wireways.

END OF SECTION

SECTION 16231

NATURAL GAS PACKAGED GENERATOR SET

PART 1 - GENERAL

1.01 References

A. The equipment covered by these specifications shall be designed, tested, rated, assembled, and installed in strict accordance with all applicable standards of ANSI, NEC, ISO, U.L., IEEE and NEMA.

1.02 Related Sections

1.03 Work Included

A. The work includes supplying a complete integrated emergency generator system. The system consists of a Natural Gas fueled generator set with related component accessories and Automatic Transfer Switch as specified herein.

B. The CONTRACTOR shall be responsible for connecting all fuel piping and any necessary auxiliary equipment (gas regulators, etc.) for a fully operational fuel system.

C. A complete system load test shall be performed after all equipment is installed.

D. The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a MANUFACTURER who has 25 years of experience building this type of equipment. Manufacturer shall be ISO9001 certified.

E. The unit shall be mounted on a structural steel subbase and shall be provided with suitable spring type isolators.

1.04 Acceptable Manufacturers

A. There shall be one source responsibility for warranty, parts, and service through a local representative with factory trained service personnel.

B. Generator Set

1. Cummins
2. Caterpillar
3. MTU
4. Kohler.

C. Automatic Transfer Switch(es)

1. ASCO
2. Kohler
3. Zenith.

1.05 Substitution

A. Proposed deviations from the specifications shall be treated as follows:

1. Requests for substitutions shall be submitted within the Q&A period. Manufacturers catalog data shall accompany each request and authorized acceptance shall be by addenda only.

2. The emergency power system has been designed to the specified manufacturer's electrical and physical characteristics.

1.06 Submittals

A. Engine-generator submittals shall include the following information

1. Factory published specification sheet indicating standard and optional accessories, ratings, etc.
2. Manufacturer's catalog cut sheets of all auxiliary components such as Automatic Transfer Switches, battery charger, control panel, enclosure, main circuit breaker, etc.
3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.
4. Weights of all equipment.
5. Concrete pad recommendation, layout, and stub-up locations of electrical and fuel systems.
6. Interconnect wiring diagram of complete emergency system, including generator, switchgear, battery charger, jacket water heater, remote alarm indications.
7. Engine mechanical data including heat rejection, exhaust gas flows, combustion air and ventilation air flows, noise data, fuel consumption, etc.
8. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
9. Generator resistances, reactances, and time constants.
10. Generator motor starting capability.
11. Control panel schematics.

12. Oil sampling analysis, laboratory location, and information.

13. Manufacturer's and dealer's written warranty.

14. Manufacturer’s Letter of Guarantee that the specified generator is adequately sized to support the electrical loads as shown on the One Line Diagram drawing.

1.07 Warranty

A. The manufacturer's standard warranty shall in no event be for a period of less than two (2) year from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Submittals received without written warranties as specified will be rejected in their entirety. The Owner shall have an option to purchase additional three (3) years comprehensive warranty.

1.08 Parts and Service Qualifications

A. The engine-generator supplier shall have service facilities within 75 miles of the project site and maintain 24-hour parts and service capability. The distributor shall stock parts as needed to support the generator set package for this specific project.

B. The dealer shall maintain qualified, factory trained service personnel that can respond to an emergency call within 1 hour of notification, 24 hours per day.

PART 2 - PRODUCT

1.09 General Requirements

A. The generator set shall be Standby kW rated as shown on the Electrical Drawings, 1800 RPM, 0.8 power factor, 480/277 V, 3 phase, 4 wire, 60 hertz, including radiator fan and all parasitic loads.

B. All materials and parts comprising the unit shall be new and unused.

1.10 Engine

A. The engine shall be spark ignition type natural gas fueled, four (4) cycle, water-cooled, vertical in-line or vee-type, operating with nominal speed not exceeding 1800 RPM.

B. The engine shall have a battery charging DC, alternator with a transistorized voltage regulator. Starting shall be a solenoid shaft, electric starter.

C. Engine speed shall be governed by an isochronous electronic governor to maintain 0% droop from no load to full load and +/- 0.25% steady state frequency variation.

D. The engine fuel system shall be designed for primary operation on natural gas having a BTU content of 1000 BTU per cubic foot delivered to the unit in a vapor state. A carburetor, secondary regulator, fuel lock-off solenoid and all piping must be installed at the point of manufacturing, terminating at a single pipe opening external to the mounting base.

1.11 Generator

A. The synchronous generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling.

B. The insulation material shall meet NEMA standards for Class H insulation and be vacuum impregnated with epoxy varnish to be fungus resistant. The excitation system shall be of brushless construction.

C. The brushless exciter shall be independent of main stator windings (either permanent magnet or auxiliary windings) and shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes. Generator shall have the ability to sustain short circuit current of 300% of rated current to allow protective devices to operate.

D. The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be a totally solid state design which includes electronic voltage buildup, volts per Hertz regulation, over-excitation protection, shall limit voltage overshoot on startup, and shall be environmentally sealed.

1.12 Circuit Breaker

A. Provide a generator mounted circuit breaker, molded case or insulated case construction, service entrance breaker. Breaker shall utilize a thermal magnetic trip, steel enclosure mounted on a separate support stand vibration isolated from the engine / generator arrangement. Lugs, sized for the cable type shown on Drawings, shall be supplied on the load side of breaker.

1.13 Controls

A. Generator Mounted Control Panel

1. Provide a generator set mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation, cycle cranking, AC metering with phase selector switch, shutdown sensors and alarms with horn and reset, adjustable cooldown timer and emergency stop push-button.

2. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 4X stainless steel enclosure with hinged door. The panel itself shall be mounted on a separate support stand isolated from the engine / generator arrangement. Panel / breaker arrangements mounted on the generator set in such a way that access to the AC Generator terminal box is restricted in any way whatsoever are not acceptable.

3. Provide the following readouts:

   Engine oil pressure

   Coolant temperature

   Engine RPM

   System DC Volts

   Engine running hours

   Generator AC volts

   Generator AC amps

   Generator frequency

4. Control Panel Annunciation - Provide the following indications for protection and diagnostics according to NFPA 110 level 1:

   Low oil pressure

   High water temperature

   Low coolant level

   Overspeed

   Overcrank

   Emergency stop depressed

   Approaching high coolant temperature

   Approaching low oil pressure

   Low coolant temperature

   Low voltage in battery

   Control switch not in auto. position

   Low gas pressure

   Battery charger ac failure

   High battery voltage

   Two (2) Spare

5. Control Panel shall be provided with three (3) relays with N.O. dry contacts rated for 120VAC, 5 Amp which can be programmed for different alarms and conditions. As a minimum, the relays shall be programmed for the following conditions:

   - Generator Running
   - Generator Warning
   - Generator Common Fault (this contact shall combine any generator fault condition).

1.14 Cooling System

A. The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 110°F (43°C) ambient air entering the room or enclosure (If an enclosure is specified). The generator set supplier is responsible for providing a properly sized cooling system based on the enclosure static pressure restriction.

1.15 Fuel System

A. All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted.

1.16 Exhaust System

A. A critical type silencer (minimum), companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation.

B. The silencer shall be mounted so that its weight is not supported by the engine.

C. Exhaust pipe size shall be sufficient to ensure that exhaust back pressure does not exceed the maximum limitations specified by the engine manufacturer.

1.17 Starting System

A. A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.

B. The heater Watt rating shall be sized by the manufacturer to maintain jacket water temperature at 90 °F minimum, and shall be a 120 Volt, single phase, 60 hertz.

C. Batteries: A lead-acid storage battery set of the heavy duty engine starting type shall be provided. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 75 ampere hours. Necessary cables and clamps shall be provided.

D. A battery tray shall be provided for the batteries and shall conform to NEC 480-7(b). It shall be treated to be resistant to deterioration by battery electrolyte. Further, construction shall be such that any spillage or boil-over battery electrolyte shall be contained within the tray to prevent a direct path to ground.

E. Battery Charger: A current limiting battery charger shall be furnished to automatically recharge batteries. The charger shall be dual charge rate with automatic switching to the boost rate when required. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC voltmeter, and fused AC input. Ac input voltage shall be 120 volts, single phase. Amperage output shall be no less than ten (10) amperes. On outdoor units the battery charger shall be mounted inside the genset enclosure.

1.18 Generator Set Enclosure – Sound Attenuated

A. The complete engine generator set, including generator control panel, and engine starting batteries, shall be enclosed in a factory assembled, sound attenuated weather protective enclosure mounted on a structural steel base.

B. The enclosure shall be constructed of galvatite (corrosion resistant) steel with electrostatically applied powder coated baked polyester paint. The enclosure shall have a resulting sound level of 75 dBA at 23 feet with the genset running under full load. It shall consist of a roof, side walls, and end walls. Fasteners shall be either zinc plated or stainless steel.

C. Number of doors on enclosure shall be as required so that all normal maintenance operations, such as lube oil change, filter change, belt adjustment and replacements, hose replacements, access to the control panels, etc., may be accomplished without disassembly of any enclosure components. Access doors shall be fabricated of the same material as the enclosure walls and shall be reinforced for rigidity.

D. Handles shall be key lockable, all doors keyed alike, and hinges shall be zinc die cast or stainless steel. Fasteners shall be zinc plated or stainless steel. Doors shall be of a lift off design allowing one person to remove door if necessary.

E. Air handling will be sized and designed by the manufacturer for a 0.5” static pressure drop through enclosure. Intake openings shall be screened to prevent the entrance of rodents.

F. Lube oil and coolant drains shall be extended to the exterior of the enclosure and terminated with drain valves. Radiator access shall be through a hinged, lockable cover on enclosure. Cooling fan and charging alternator shall be fully guarded to prevent injury.

G. Enclosure manufacturer shall internally mount the exhaust silencer(s) and maintain the weather resistant integrity and aesthetic appearance of the system. Externally mounted silencers will not be permitted for safety and aesthetic reasons.

H. Lifting points shall be provided on base frame suitable for lifting combined weight of generator set and enclosure.

1.19 Automatic Transfer Switch

A. GENERAL

1. The transfer switch shall be rated for the voltage and ampacity as shown on the Drawings and shall have 600-volt insulation on all parts in accordance with NEMA standards.
2. The current rating shall be a continuous rating when the switch is installed in an unventilated enclosure and shall conform to NEMA temperature rise standards. Designs which require cabinet ventilation are unacceptable and do not meet this specification.
3. The unit shall be rated based on all classes of loads, i.e., resistive, tungsten, ballast and inductive loads. Switches rated 400 amperes or less shall be UL listed for 100% tungsten lamp load.
4. As a precondition for approval, all transfer switches complete with accessories shall be listed by Underwriters Laboratories, under Standard UL 1008 (automatic transfer switches) and approved for use on emergency systems.
5. The withstand current capacity of the main contacts shall not be less than 20 times the continuous duty rating when coordinated with any molded case circuit breaker established by certified test data.
6. Temperature rise tests in accordance with UL 1008 shall have been conducted after the overload and endurance tests to confirm the ability of the units to carry their rated currents within the allowable temperature limits.
7. Transfer switches shall comply with the applicable standards of UL, CSA, ANSI, NFPA, IEEE, NEMA and IEC.
8. The transfer switches shall be supplied with a solid-state control panel as detailed further in these specifications.

B. SEQUENCE OF OPERATION

1. The ATS shall incorporate adjustable three phase under-voltage sensing of the normal source.

2. When the voltage of any phase of the normal source is reduced to 80% of nominal voltage, for a period of 0-10 seconds (programmable) a pilot contact shall close to initiate starting of the engine generator.

3. The ATS shall incorporate adjustable single-phase under-voltage sensing of the emergency source.

4. When the emergency source has reached a voltage value within 10% of nominal voltage and achieved frequency within 5% of the rated value, the load shall be transferred to the emergency source after a programmable time delay.

5. When the normal source has been restored to not less than 90% of rated voltage on all phases, the load shall be re-transferred to the normal source after a time delay of 0 to 30 minutes (programmable). The generator shall run unloaded for 5 minutes (programmable) and then automatically shut down. The generator shall be ready for automatic operation upon the next failure of the normal source.

6. If the engine generator should fail while carrying the load, retransfer to the normal source shall be made instantaneously upon restoration of proper voltage (90%) on the normal source.

7. The transfer switch shall be equipped with a solid-state control panel. The control panel shall perform the operational and display functions of the transfer switch. The display functions of the control panel shall include ATS position and source availability.

8. The control panel shall include indicators for timing functions, and ATS test switch.

9. The control panel shall be provided with calibrated pots (accessible only by first opening the lockable cabinet door) to set time delays, voltage and frequency sensors. The ATS shall be capable of being adjusted while the controls are energized and the unit in automatic mode. Designs which force a "programming mode" or require the controls be de-energized during adjustment are unacceptable.

10. The control panel shall be opto-isolated from its inputs to reduce susceptibility to electrical noise and provided with the following inherent control functions and capabilities:

    a. An LED display for continuous monitoring of the ATS functions.
    b. Built-in diagnostic display.

c. Test switch to simulate a normal source failure.
d. Time delay to override momentary normal source failure prior to engine start. Field programmable 0-10 seconds (continuously adjustable via a calibrated potentiometer factory set at 3 seconds.
e. Time delay on retransfer to normal source, continuously adjustable 0-30 minutes, factory set at 30 minutes. If the emergency source fails during the retransfer time delay, the transfer switch controls shall automatically bypass the time delay and immediately retransfer to the normal position.
f. Time delay on transfer to emergency, continuously adjustable 0-15 seconds, factory set at 1 second.
g. An in-phase monitor or time delayed neutral shall be provided to prevent excessive transient currents from switching motor loads.
h. An interval-type automatic clock exerciser with load/no load selectability shall be incorporated in the ATS.

C. CONSTRUCTION AND PERFORMANCE

1. The automatic transfer switch shall be service entrance rated as shown on Electrical Drawings. There shall be a direct mechanical coupling to facilitate transfer in 6 cycles or less.

2. The normal and emergency contacts shall be mechanically interlocked such that failure of any coil or disarrangement of any part shall not permit a neutral position.

3. For switches installed in systems having ground fault protective devices, and/or wired so as to be designated a separately derived system by the NEC, a 4th pole shall be provided. This additional pole shall isolate the normal and emergency neutrals. The neutral pole shall have the same withstand and operational ratings as the other poles and shall be arranged to break last and make first to minimize neutral switching transients. Add-on or accessory poles that are not of identical construction and withstand capability are not acceptable.

4. The contact structure shall consist of a main current carrying contact, which is a silver alloy with a minimum of 50% silver content. The current carrying contacts shall be protected by silver tungsten arcing contacts on all sizes above 400 Amps.

5. The transfer switch manufacturer shall submit test data for each size switch required for this project, showing that it can withstand fault currents of the magnitude and the duration necessary to

maintain the system integrity. Minimum UL listed withstand and close into fault ratings shall be as follows:

Any Molded Case Breaker*:

Size (Amps)	(RMS Symmetrical)
Up to 200	10,000

Specific Coordinated Breaker*:

Size (Amps)	(RMS Symmetrical)
Up to 150	30,000

Current Limiting Fuse*:

Size (Amps)	(RMS Symmetrical)
Up to 4000	200,000

*All values 480 volt, RMS symmetrical, less than 20% power factor.

Note: Actual necessary current withstand ratings for this project may be higher than the minimums listed above. Refer to electrical plans for exact requirements.

6. The automatic transfer switch manufacturer shall certify sufficient arc interrupting capabilities for 50 cycles of operation between a normal and emergency source that are 120 degrees out of phase at 480 volts, 600% of rated current at .50 power factor. This certification is to ensure that there will be no current flow between the two isolated sources during switching.
7. All relays shall be continuous duty industrial type with wiping contacts. Customer interface contacts shall be rated 10 amperes minimum. Coils, relays, timers and accessories shall be readily front accessible. The control panel and power section shall be interconnected with a harness and keyed disconnect plugs for maintenance.
8. Main and arcing contacts shall be visible without major disassembly to facilitate inspection and maintenance.
9. A manual handle shall be provided for maintenance purposes with the switch de-energized. An operator disconnect switch shall be provided to defeat automatic operation during maintenance, inspection or manual operation.
10. The switch shall be mounted in a NEMA 4X stainless steel enclosure unless otherwise indicated on the plans.

11. Switches composed of molded case breakers, contactors or components thereof not specifically designed as an automatic transfer switch will not be acceptable.

12. To afford the advantage of a single source of supply to the owner, the automatic transfer switch shall be supplied by the manufacturer of the engine generator set and covered under the same warranty program.

PART 3 - EXECUTION

1.01 Installation

A. Install equipment in accordance with manufacturer's recommendations, the project drawings and specifications, and all applicable codes. Installation of the system includes but is not limited to pouring a concrete pad for the generator set and automatic transfer switch, receiving and offloading the equipment, providing all labor, permits and material to install the total system.

1.02 Start-Up and Testing

A. Coordinate all start-up and testing activities with the Engineer and Owner.

B. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following:

1. Verify that the equipment is installed properly.

2. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, remote annunciator, etc.

3. Test all alarms and safety shutdown devices for proper operation and annunciation.

4. Check all fluid levels.

5. Start engine and check for exhaust, oil leaks, vibrations, etc.

6. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.

7. Connect the generator to building load and verify that the generator will start and run all designated loads in the plant.

C. Perform a 4 hour load bank test at full nameplate load using a load bank and cables supplied by the local generator dealer. Observe and record the following data at 15 minute intervals:

1. Service meter hours

2. Volts AC - All phases

3. Amps AC - All phases

4. Frequency
5. Power factor or Vars
6. Jacket water temperature
7. Oil Pressure
8. Ambient temperature

D. Operation and Maintenance Manuals

1. Provide three (3) sets of operation and maintenance manuals covering the generator, switchgear, and auxiliary components. Include parts manuals, final as-built wiring interconnect diagrams and recommended preventative maintenance schedules.

E. Training

1. Provide one day of on-site training to instruct the owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION

SECTION 16455

GROUNDING

PART 1 - GENERAL

1.01 Scope

A. Power system grounding.

B. Communication system grounding.

C. Electrical equipment and raceway grounding and bonding.

1.02 System Description

A. The system consists of ground grids for building grounding; ground clusters for supplemental electrodes; and connections thereto of structures, equipment and electrical systems.

B. This Section is intended to supplement the requirements of the NEC, particularly Article 250, and to differentiate among options allowed by the NEC. This Section is not intended to reiterate explicit requirements of the NEC.

C. Within this Section the following definitions apply:

1. Ground Grid: A horizontal loop, electrically and mechanically continuous; routed approximately three feet inside the building perimeter. Where any building dimension exceeds 100 feet provide cross ties spaced not farther than 50 feet apart connected to the perimeter loop and to each other at all points of intersection to form a grid.

2. Ground Cluster: An assembly of three or more driven ground rods; spaced not closer than eight feet apart; each rod connected to the others in a closed delta configuration; and providing a resistance to ground of not more than 10 ohms.

3. Connect or Bond: For underground or otherwise inaccessible locations - a permanent connection made by exothermic welding, brazing, or similar process. For exposed and accessible locations - a connection made with clamps, bolts or similar fittings approved for the purpose.

1.03 Submittals

Submit product data.

PART 2 - PRODUCTS

2.01 Materials

A. Bare Conductors: ASTM B-8; stranded; hard drawn copper. Size unless otherwise noted is #4/0 AWG.

B. Ground Rods: UL 425H; 5/8-inch x 8 feet; high strength steel core with metallically bonded copper jacket.

PART 3 - EXECUTION

3.01 Installation

A. Except as noted, use insulated ground conductors only where installed in a raceway. Use bare conductors for the ground grid, ground rod connections, and bonding of buildings, structures etc. Where a bare conductor is installed in a raceway use only non-metallic raceways; do not install bare conductors in metallic raceways.

B. Either embed the ground grid in the concrete building foundation 2 to 4-inches from the bottom or bury the grid three feet deep in the earth. For each 100 feet or fraction thereof of ground grid conductor provide connections to earth by one of the following:

1. Where deep column footings (more than eight feet below grade) are used provide a vertical tap from the grid to the bottom of the footing.

2. Where only shallow footings are available connect the ground grid to a driven ground rod.

C. Drive ground rods so the top is 3 to 6-inches below finished grade. If rock is encountered then rods may be driven at an angle or grounding plates, as approved by the Engineer, may be used.

D. Construct ground clusters as follows: Start with three driven ground rods and measure the resistance to ground of each rod. If the parallel combination exceeds 10 ohms then add sections and drive the rods deeper or drive additional rods until the specified value is obtained. Connect each rod to every other rod in the cluster. Exception: not more than three additional rods or sections (six total) are required for any one cluster.

E. Where bare conductors emerge from concrete encasement, provide a 4-inch length of Schedule 40 PVC conduit set in the concrete to protect the conductor.

3.02 Service Entrance Equipment

A. Bond service entrance equipment ground bus to the ground grid with a No. 4/0 conductor.

B. Provide one ground cluster outside the building at the closest practical location to the service entrance equipment and bond to ground bus with a No. 4/0 conductor.

C. If a metallic cold water pipe is available for a grounding electrode make connection on the street side and bond around the water meter.

D. Prior to energizing the system remove the neutral link and meggar the system neutral. Repair any grounds then replace the neutral link.

3.03 Buildings

A. Bond all steel building columns to the ground grid.

B. Provide outside access to the ground grid every 100 feet (two locations minimum) or as indicated by means of a test well. Note locations on the as-built drawings.

3.04 Separately Derived Systems

A. Ground transformer enclosures and, where solidly grounded systems are indicated, the secondary neutral to one of the following:

1. The ground grid.

2. The building steel.

3. Other electrode as permitted by NEC if none of the above are available.

B. Ground generator frame and neutral to the ground grid.

3.05 Underground Distribution Systems

A. Route a bare conductor through each duct bank. Connect to building ground grid, equipment frame or ground pad as applicable.

B. Provide a driven ground rod at each electrical manhole. Connect to duct bank ground conductor accessible in the manhole.

C. Provide two ground clusters at opposite corners of pad transformers. Connect to transformer secondary compartment grounding lug. Bond primary and secondary ground lugs and duct bank grounding conductor.

3.06 Field Quality Control

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Notify the Owner's representative at least one week in advance that the ground grid for each structure is ready for inspection. Obtain written notice to proceed before filling trenches, pouring slabs, or otherwise covering the work.

C. Compile and submit a list of ground resistance measurements for each ground rod in ground clusters. Measure and submit resistance to ground of service equipment ground bus.

D. Make resistance to ground measurements in normal, dry weather conditions not less than 24 hours after rainfall. Make measurements using the fall of potential method per IEEE Standard No. 142.

END OF SECTION

SECTION 16950

TESTING

PART 1 - GENERAL

1.01 Scope

A. Provide all equipment, tools, rigging, and experienced technicians to ensure the completion of services as outlined herein.

B. A complete written report shall be furnished including a listing of equipment which needs repair, equipment settings, "As Found" and "As Left" condition, forms for breaker test, transformer test, etc., as required for pertinent data and acknowledgment that the work has been completed.

C. Applicable Codes, Standards and References

1. All inspections and tests shall be in accordance with the following codes and standards, except as provided otherwise herein.

a. National Electrical Manufacturer's Association (NEMA)

b. American Society for Testing and Materials (ASTM)

c. Institute of Electrical and Electronic Engineers (IEEE)

d. International Electrical Testing Association (NETA) Maintenance Testing Specifications - MTS-1989

e. American National Standards Institute (ANSI) - ANSI C2: National Electrical Safety Code

f. State and local codes and ordinances

g. Insulated Cable Engineers Association (ICEA)

h. Association of Edison Illuminating Companies (AEIC)

i. Occupational Safety and Health Administration (OSHA)

j. National Fire Protection Association (NFPA)

i. ANSI/NFPA 70: National Electrical Code

ii. ANSI/NFPA 70B: Electrical Equipment Maintenance

iii. NFPA 70E: Electrical Safety Requirements for Employee Workplaces

iv. ANSI/NFPA 78: Lightning Protection Code

v. ANSI/NFPA 101: Life Safety Code

D. Definitions

1. Low Voltage: 0 to 600 volts.

2. Medium Voltage: 1 KV to 15 KV.

3. High Voltage: Above 15 KV.

E. Suitability of Test Equipment

1. All test equipment shall be in good mechanical and electrical condition.

2. Split-core current transformers and clamp-on or tong type ammeters require careful consideration of the following in regard to accuracy:

a. Position of the conductor within the core.

b. Clean, tight fit of the core pole faces.

c. Presence of external fields.

d. Accuracy of the current transformer ratio in addition to the accuracy of the secondary meter.

3. Selection of metering equipment should be based on a knowledge of the waveform of the variable being measured. Modern digital multimeters may be average or rms sensing and may include or exclude the dc component. When the variable contains harmonics or dc offset and, in general, any deviation from a pure sine wave, average sensing, rms scaled meters may be misleading.

4. Field test metering used to check power system meter calibration must have an accuracy higher than that of the instrument being checked.

5. Accuracy of metering in test equipment shall be appropriate for the test being performed but not in excess of two percent of the scale used.

6. Waveshape and frequency of test equipment output waveforms shall be

appropriate for the test and tested equipment.

F. Test Instrument Calibration

1. The testing firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.

2. The accuracy shall be directly traceable to the National Institute of Standards and Technology.

3. Instruments shall be calibrated in accordance with the following frequency schedule:

a. Field Instruments: Analog - six months maximum; Digital - 12 months maximum.

b. Laboratory Instruments: 12 months.

c. Leased Specialty Equipment: 12 months (where accuracy is guaranteed by lessor).

d. Dated calibration labels shall be visible on all test equipment.

e. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date.

f. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.

g. Calibrating standards shall be of higher accuracy than that of the instrument tested.

G. Acceptable Testing Companies

1. Hood, Patterson, Dewar, Inc. (404) 296-5995.

2. Westinghouse Electrical Corporation (404) 885-5418.

3. Cleveland Electric Company (404) 696-4550.

PART 2 - EQUIPMENT TESTING

2.01 Molded Case Circuit Breaker - 100 Amp and Above

A. Mechanical, Electrical, and Visual Inspection

1. Refer to the manufacturer's instruction manual.

    a. Check breaker against single-line drawing or panel schedule for correct rating, conductor size, and feeder designation.

    b. Clean breaker case and inspect for cracks, heat damage, or other defects.

    c. Check external connections for tightness, and signs of overheating. Torque bolts to the manufacturer's specifications.

    d. Remove breaker covers on unsealed units. Inspect internal components for conditions and check for tightness on removable trip units, fused breakers, etc. (Do not remove any cover or components of breakers which will void UL label.)

    e. Operate breaker three times to insure smooth operation.

2. Prior to the electrical and meggar test, disconnect all equipment, such as transformers, relays, control devices, etc., which could be damaged by the test.

    a. Check long-time delay at 300 percent of trip unit rating.

    b. Check short-time delay at settings, if applicable.

    c. Check instantaneous pick-up.

    d. Check ground fault pick-up and delay at settings, if applicable.

    e. Check contact resistance with a low resistance ohmmeter. (A millivolt drop test may be conducted.)

    f. Check breaker insulation resistance with a 1,000 volt DC megohmeter for one minute each.

        i. Phase to Phase - Breaker Closed.

        ii. Phase to Ground - Breaker Closed.

        iii. Across Contacts - Breaker Open.

    g. Check electrically operated breakers for proper operation, including auxiliary devices (ground fault, undervoltage trip, remote trip, etc.), when applicable.

h. Check breakers with solid state trip devices with a solid state tester and by primary current injection in accordance with the manufacturer's recommendations.

2.02 Switches

A. Low Voltage Air Switches

1. Mechanical, Electrical and Visual Inspection

a. Inspect for physical and mechanical condition.

b. Check for proper anchorage and required area clearances.

c. Perform mechanical operation tests.

d. Check blade alignment.

e. Check each fuse holder for adequate mechanical support of each fuse.

f. Inspect all bus or cable connections for tightness torque in accordance with the manufacturer's recommendations.

g. Test all electrical and mechanical interlock systems for proper operation and sequencing.

h. Vacuum and clean entire switch. (If cleaning solution is used, use only type recommended by the manufacturer.)

i. Check proper phase barrier materials and installation.

j. Lubricate in accordance with the manufacturer's instructions. (Use only manufacturer's recommended lubricant.)

k. Exercise all active components.

l. Inspect all indicating devices for proper operation.

2. Electrical Tests

a. Perform insulation resistance tests on each pole, phase-to-phase and phase-to-ground for one minute each.

b. Perform contact resistance test across each switch blade and fuse holder.

2.03 Distribution Switchboards, Panelboards, Load Centers

A. Mechanical, Electrical, and Visual Inspection

1. Refer to the manufacturer's instruction manual.

a. Check nameplate information and compare to Drawings and Specifications.

b. Check breakers and switches against single line diagram or schedule for correct rating, conductor size, and feeder designation.

c. Vacuum and clean interior of enclosure. (If cleaning solution is used, use only type recommended by the manufacturer.)

d. Test operation of switches and inspect their contacts and operating mechanisms.

e. Inspect fuses for overheating and adequate spring tension. Record contact resistance of fuse to fuse holder.

f. Check interlocks for proper operation.

g. Inspect insulation.

h. Check tightness of bolted bus connections, breaker, switches and all accessible bolts. Torque to the manufacturer's specifications.

i. Inspect structure, frame, supports, barriers, bus connections, etc., for proper alignment and fit.

j. Check wire insulation for deterioration.

k. Check wire terminations for tightness.

l. Lubricate in accordance with the manufacturer's instructions. (Use only manufacturer's recommended lubricant.)

2. Prior to the electrical and meggar test, disconnect all equipment, such as transformers, relays, control devices, etc., which could be damaged by the test.

a. Check ammeter, voltmeter and other panel instruments with secondary standards.

b. Check bus insulation with a DC megohmmeter, phase-to-phase, and phase-to-ground for one minute each.

c. Perform Function Test of remote control and monitoring devices, such as shunt trips, indicating lights, alarms, etc.

d. Check and test breakers and switches as indicated in the Breaker and Switch sections of these Specifications. (If cleaning solution is used, use only type recommended by the manufacturer.)

2.04 Thermographic Survey

A. Visual and Mechanical Inspection

1. Inspect for physical, electrical and mechanical condition.

2. Visually inspect for bus alignment.

3. Remove all necessary covers prior to scanning.

B. Equipment to be Scanned: Switches, busway, open buses, switchgear, cables, cable and bus connections, circuit breakers, rotating equipment, and load tap changer or current carrying devices.

C. Provide Report Indicating the Following:

1. Problem area (location of "hot spot").

2. Temperature rise between "hot spot" and normal or reference area.

3. Cause of heat rise.

4. Phase unbalance, if present.

5. Areas scanned.

6. Risk factor:

a. "1" (0 - 20° C),

b. "2" (20 - 100° C),

c. "3" (100 C and above).

7. Picture of thermal image showing temperature and Polaroid scene shall

be included next to each other in the report.

D. The equipment shall include a Polaroid camera mount over the top of a CRT screen such that a hard copy of the scene view, as well as the thermographic image, can be made. Operational parameters for the equipment shall be -20 to +1500 degrees C. Thermographic images of overheating and color Polaroid picture of device should be provided next to each other in the report.

E. Approved Equipment

1. Agema Thermovision System 470.

2. Approved equal ten days prior to Bid.

PART 3 - RECORDS AND REPORTS

3.01 Reports

A. A testing service's standard report may be used, but should include a minimum of the following items:

1. Summary of Project.

2. Description of equipment tested, and name plate data.

3. Description of test.

4. Test results.

5. All tripping and clearing times, pick-up and delay settings, resistance measurements, etc.

6. All operational dimensions and tolerances.

7. All parts which should be replaced.

8. "As Found" and "As Left" conditions.

9. Acknowledgment in writing that each item listed in Part 2 has been completed.

10. Any obvious coordination or other problems.

END OF SECTION

SECTION 17000

INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 Scope

A. Work provided under this Division includes final system design implementation, furnishing all components, system programming and configuration, system installation services, required support services, and complete documentation for the Plant Control System. This work shall include all materials, labor, and tools required to fabricate, deliver, unload, handle, erect, adjust, field calibrate, and test a complete and operable Plant Control System as indicated on the Drawings and Specifications. Install all panels and designated instrumentation devices and provide all mechanical and pneumatic interconnections between the various components and their local sources of supply.

B. The intent of these Specifications is for the System Manufacturer to provide a complete and operational Plant Control System. Additional items of equipment, materials, or labor not specifically called for by these Specifications, which may reasonably be considered to make the system complete and operational, shall be supplied as part of this work.

C. The System Manufacturer shall be responsible for integrating communication and facilitating data transfer between the Equipment Manufacturer's systems and the Plant Control System.

1.02 Definitions

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared documentation, specific to the installation.

D. Indicated: Shown on the Drawings.

E. Noted: Indicated or specified elsewhere.

1.03 Work Specified Elsewhere

A. Installation of Inline Instruments: Instruments such as venturi tubes, magmeters, and control valves, which are specified in this Division and mounted in process piping, are installed under other Divisions.

B. Vendor-Supplied Devices: Field instrumentation and panels supplied as part of mechanical equipment or equipment packages shall be furnished, installed, and calibrated under other Divisions.

C. Conductors: Discrete signal conductors, twisted pair analog signal conductors, and RTD conductors are furnished and installed under Division 16. All other instrumentation and signal conductors, including digital data conductors and fiber optic cables are furnished under this Division and installed under Division 16. Special cables for a particular instrument device which are specified in this Section are installed under Division 16.

D. Raceways: All raceways and pulling of conductors (including placement in cable trays) are furnished under Division 16.

E. Terminations: All power, control and signal conductor terminations are provided under Division 16. This shall include, but not be limited to, terminations for all control panels. RS-485, RS-232, fiber optic, Ethernet, and other digital communications media terminations shall be provided under this Division including digital terminations to motor protection relays, power monitoring units, particle counters, and other devices. Exceptions: HVAC control terminations are provided under Division 15. Interconnections between equipment and integral equipment control panels (i.e., package are compressors) are provided under the applicable equipment Section.

1.04 Plant Control System Description

A. The Plant Control System consists of programming and configuration, operator interface, Plant Control Network, local control panels, field instruments and control devices, and other appurtenances noted in these Specifications.

B. Major components of the Plant Control System are as follows:

Panel	Location	Area Controlled	New/Existing
PCP-1	Kensington Road Pump Station	Kensington Road Pump Station	New

C. Prior to starting work on the Project, the System Manufacturer shall attend a one-day I&C kick-off meeting with the Owner and Contractor at the Owner's facility. The purpose of the meeting is to review the Division 17 Project requirements in detail. Meeting minutes shall be generated and a copy of the meeting minutes shall be sent to the Contractor, Engineer, and Owner. Topics of the meeting shall include but not be limited to the following:

1. Overview of the Project.

2. Review and discuss existing graphic symbology with the Owner. Colors and animation for running, stopped, unacknowledged alarm, acknowledged alarm, tank levels, etc. Discuss the overview screen and the manner in which the operators shall navigate between screens.

3. Security levels (password protection) shall be discussed with the Owner. The Owner shall have the capabilities to add, delete and modify employee names and security levels.

4. Discuss auto-restart control logic with the Owner.

5. Review the Division 17 Specifications. This shall include the Owner's EtherNet standards and the specific requirements as they apply to this Project.

D. The pump station shall be controlled by control logic residing in the Division 17 local control panel (PCP-1).

E. Flygt Multismart Pump Station controller shall be provided in Pump Control Panel PCP-1.

F. New RTU telemetry equipment will be provided at the pump station. The new RTU telemetry equipment shall be housed in a NEMA 4X stainless steel enclosure that shall be mounted on a unistrut utility rack. The antenna shall be mounted directly on top of the enclosure. The pump station shall communicate with the Dekalb County Department of Watershed Management network.

G. The new RTU telemetry equipment shall be match the cellular system used by Dekalb County Department of Watershed Management as manufactured by Telog Instruments. The System Manufacturer shall verify the manufacturer, model number and communications protocols with the Owner prior to submitting.

H. Provide auto-restart control logic to perform an orderly, sequenced restart of the wetwell pumps upon a loss of power. Equipment shall be sequenced to restart without causing fluctuations in the utility power or stalling the generator. Provide a 0-90 second operator adjustable time-delay, initially set at 90 seconds, prior to initiating the auto-restart control logic after a loss of power has been detected. Provide a 0-60 second operator adjustable time-delay, initially set at 30 seconds, prior to starting subsequent equipment.

I. Due to the operation of the generator the PLC shall automatically stagger the pump starts such that the pumps will have a time delay of 15 seconds

prior to starting a second or third pump. This will permit the generator to come back up to speed after a single pump is started. The time delay shall be hardcoded in the PLC program and an operator will not have the ability to change it.

1.05 Quality Assurance

A. The Contractor shall ensure that the Plant Control System is an integrated system furnished by the System Manufacturer who shall provide all of the equipment and appurtenances, regardless of manufacture and be responsible to the Contractor for correct operation of the entire system.

B. The System Manufacturer shall be responsible for the detailed design implementation and the proper functioning of the Plant Control System, programming and/or configuration of all digital hardware, preparation of required submittal data including operations and maintenance manuals, preparation of test procedures, factory and field tests, start-up including field calibration, operational demonstrations, providing technical supervision for installation and connections to equipment, and training of the Owner's operating personnel.

C. The System Manufacturer shall be regularly engaged in the type of work called for under these Specifications and must have capital facilities, personnel, plant, and service capabilities required to successfully perform the work. The System Manufacturer shall employ competent personnel experienced in the design, manufacture, and programming of equipment and systems required. The System Manufacturer shall assign an experienced person who shall act as Project Manager. This person shall have responsible project experience on similar systems of a comparable complexity to that specified herein.

D. The System Manufacturer shall have in employment, a permanent field service organization capable of providing service and maintenance of the system.

E. The System Manufacturer shall have installed similar systems which have been in satisfactory operation to establish the reliability of the equipment proposed to be furnished.

F. Acceptable Manufacturers for the Division 17:

1. Southern Flow, Inc., Marietta, Georgia

2. M/R Systems, Inc., Norcross, Georgia

3. Revere Control Systems, Birmingham, Alabama

G. Acceptable Manufacturers for the Kensington Road Pump station HMI

Software/SCADA Graphics/Telemetry System: Southern Flow, Inc., MR Systems, Inc.

1.06 Submittals

A. The System Manufacturer shall make submittals in accordance with the requirements of Section 01340. The submittal shall be divided into separate sections as listed below. Refer to related work sections for additional requirements.

B. Field Devices: This Section shall include primary elements, transmitters, switches, analytical instruments, etc. List all dimensions, power requirements, enclosure types, ranges, and signal form or value. Provide data, including proposed length, on special cables required between sensing elements and electronics units and data on any special equipment used for calibration or maintenance of a particular device. Field device submittals shall also include specific data sheets for each device which shall contain the following information:

1. Tag number per Specifications and Drawings.

2. Manufacturer's complete model number with complete model number breakdown.

3. Input – output characteristics.

4. Range, size, and graduations.

5. Physical size with dimensions, NEMA enclosure classification and mounting details.

6. Materials of construction of all components.

7. Instrument or control device sizing calculations where applicable.

8. Certified calibration data on all flow metering devices.

9. Environmental requirements during storage and operation.

10. Power requirements.

C. Digital System Hardware: This Section shall include computer hardware complete with printers, magnetic storage devices, cables, UPS systems, and other peripherals. Include PLC hardware, communications hardware, and LAN and data highway conductors.

D. Digital System Software: This Section shall include documentation on system software, standard software packages supplied, and custom software developed for reports, process control, and graphic displays. Include software developed for both the operator interface and PLC system.

E. Control Panels: This Section shall include dimensions, terminal block designations, front panel arrangement, back panel layout, and ladder logic diagrams for both PLC-based and discrete component type control panels, etc. Provide catalog sheets for all panel components, indicate ranges, and provide nameplate schedules. All connections for new instruments terminating in the System Manufacturer's panels shall be clearly shown. All devices installed in each panel or connected to each panel, shall be identified on the panel drawings by the tag number included in the Specifications and Drawings. Any miscellaneous equipment not clearly falling into one of the above volumes, including recommended spare parts list shall be included in the control panel volume.

F. Loop Diagrams: This Section includes no more than 10 typical loop diagrams for approval of format only. The submitted loop diagrams shall represent different types of process measurements.

G. Factory Test: This Section shall include the witness test and final checkout procedural outline detailed in Article 3.04 B.

1.07 Construction Documentation

The System Manufacturer shall provide loop diagrams to the Contractor. The Contractor shall provide loop diagrams to the electrical subcontractor. Loop diagrams shall be issued as a group with the delivery of their respective control panel or area instrumentation. Two sets of loop diagrams shall be issued to the electrical contractor and one set to the Engineer.

1.08 Record Documentation

A. General: Record documentation shall be provided in accordance with Section 01720. Additionally, provide all information listed in Article 1.06 above, corrected to reflect the system as installed. Include also any instruction books, operation manuals, and other information pertaining to service and maintenance. Bind record documents in 3-ring, hardback notebooks complete with tabs and index. Include name, address, and telephone number for each manufacturer's service contact. For all major components, provide a recommended spare parts list.

B. Loop Diagrams

1. Provide an individual wiring diagram for each analog and discrete loop

showing all terminations, terminal numbers, conductor numbers, cable numbers, the location of the DC power supply, power panel, and circuit numbers for all 120 VAC power to field instruments, MCC and bucket numbers for all 480 VAC power to motor operated valves, signal polarity, the location of any dropping resistors, surge protectors, shielding, grounding, etc. Devices shall be identified by the tag number included in the Specifications and Drawings. Cabling between sensors/elements and associated transmitter shall be included. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus the requirements below.

2. Each loop diagram shall be divided into areas for identification of device locations (e.g., panel face, back-of-panel, field, etc.) Loop diagrams shall be on 11 x 17-inch drawings.

3. The loop number shall be incorporated into the loop diagram drawing number. If the System Manufacturer does not have any specific loop diagram drawing number requirements, the drawing number shall be the loop number (the drawing number for loop F-1004 would be 1004). If a requirement exists (one requirement may be to incorporate the Project number XXXXXX), the loop number shall be included as the suffix. The drawing number for loop F-1004 would be XXXXXX-1004.

C. Instrument Hardware: Record documents shall include bills of material, front views, assembly drawings, component layout drawings and schematics, nameplates, schedules, electrical schematics, electrical connection diagrams, and tubing/piping connection diagrams. Electrical and piping connection diagrams shall show all terminations of equipment, complete with instrumentation, wire, equipment, and cable designations. Interconnecting diagrams shall be prepared in a neat and legible manner on 11 x 17-inch or 24 x 36-inch sheets.

D. Software Documentation: In addition to the hard copies of drawings, programming and literature generated specifically for the Project, two sets of compact disks shall be provided to the Owner with copies of all custom files specifically created for the Project, including all panel drawings, I/O drawings, termination drawings, communication architecture drawings, data sheets, bills of material, operating procedures, etc. Additional files included in this set shall be PLC programs and copies of the operator interface software application program. Drawing format shall be AutoCAD latest version. All Drawings shall also be furnished as Acrobat *.pdf files. Include copies of all *.shp and *.shx files used in the AutoCAD drawings. Compact discs shall have a complete listing of their contents along with the names and version numbers of the software used to generate each file. Discs shall be clearly identified by the following:

1. Project Name

2. Volume Number

3. Labeled “AS-INSTALLED”

E. Configuration Documentation: Instrument Configuration and Calibration sheets shall be generated for all instruments requiring configuration and/or calibration. The intent of the Instrument Configuration and Calibration sheets is to provide all necessary information required to enable the Owner to calibrate and/or configure a replacement instrument identical to the original instrument. One sheet shall be provided for each instrument. The sheets shall be 8-1/2 x 11-inch size and shall be included in the O&M Manual. Each sheet shall list the instrument tag number (as depicted on the Drawings and Specifications), the date, the System Manufacturer company name and phone number, the name of the individual who filled out the sheet, the instrument manufacturer’s name and phone number, the complete model number, the calibrated range, and all configuration information.

F. SCADA Documentation: Generate a SCADA software document containing the following information for each SCADA related software product purchased.

1. The facility/plant name where the software is installed.

2. The computer name that the software is installed on (master SCADA workstation, historical data computer, etc.)

3. The computer manufacturer and model, processor speed, and installed RAM.

4. The computer operating system (model and version).

5. The product name, version, and serial number.

6. The name and quantity of client licenses (if applicable).

7. The product name and version of all supporting software installed.

8. The date purchased and the company name it was purchased from.

9. The name of the person purchasing the software, and the person’s company name.

10. The date the software was installed.

1.09 Environment

A. Local Control Panels: Local control panels shall be capable of operating between 32 degrees and 120 degrees F and 5 to 95 percent relative humidity without condensation. A 120 VAC single-phase, three-wire grounded power source will be supplied.

B. Field Devices: Field devices shall be housed in NEMA 4X enclosures. Ambient temperature rating shall be suitable for the Project locale. All enclosures, including field instruments and control panels, which are located out-of-doors shall be provided with adequate sunscreens.

1.10 Deliver, Storage, and Handling

A. After completion of shop assembly and tests, control panels shall be enclosed in heavy polyethylene envelopes to provide complete protection from dust and moisture. Desiccant materials shall be placed inside the envelope prior to sealing. The equipment shall then be mounted on skids, enclosed in protective boxes, and braced for final transport. Removable lifting rings shall be provided on all sections weighing more than 150 pounds to permit moving without removal of protective covering. Shipping weights shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling on the job site. If practical, termination cabinets shall be delivered first to permit field wiring to be complete and checked out before receipt of remainder of equipment. None of the control room equipment shall be delivered until the environmental services required by the Specifications and Drawings are available and operating in accordance with manufacturer's specifications.

B. The Contractor shall be fully responsible for moving the equipment through new and existing facilities and setting it in the proper location.

1.11 Warranty

A. Warranty Period: In accordance with Division 1 and the following:

1. Corrective hardware maintenance shall be performed by a trained service technician specifically trained to service the equipment involved. The technician shall be available, on-site, within 24 hours after notification by the Owner.

2. Software maintenance shall be performed by suitably qualified individuals from the System Manufacturer's software service staff. Representatives from third party software sources may additionally be involved, but the System Manufacturer shall be represented at all times during on-site services. Software service representative shall be available for consultation within four hours and, if required, on-site within 16 hours after notification by the Owner.

3. Deliver a copy of all service reports to the Owner on the day the work is performed.

PART 2 - PRODUCTS

2.01 Equipment

A. Quality Standards: It is not the intention of these Specifications to detail every component, accessory, signal conditioning device, etc. that is required to provide a complete system. The System Manufacturer shall provide all required components, using equipment from established manufacturers with a proven history of service and support.

B. Electronic Equipment: All solid state, printed circuit boards and components shall be suitable for the specified environment. Provide complete circuit diagrams for troubleshooting and repair. All parts shall be replaceable with standard commercial components without degrading the performance of the completed assembly.

2.02 Spare Parts

A. The System Manufacturer shall supply spare parts for the Plant Control System.

B. The System Manufacturer shall provide a list of all spare parts being provided under this Division. The spare parts list shall be included in the documents to be reviewed by the Engineer during the shop drawing review process. The spare parts shall include, but shall not be limited to, the items included in the list below.

1. One lot of PLC Fuses, 10 spare fuses for each type of fuse used in the PLC.

2. One lot of Terminals, 10 spare terminals for each type of terminal used in local control panels.

3. One lot of Terminal Fuses, 10 spare fuses for each type of miscellaneous fuse used in local control panels.

4. Five ice-cube relays.

5. One lot of surge protectors, including 2 spares of each type used.

6. One 24 VDC power supply.

7. Other spares as noted in other Division 17 Sections.

2.03 Substitutions

See Section 01630.

PART 3 - EXECUTION

3.01 Installation

A. The System Manufacturer shall assign a full time representative to provide coordination and supervision of on-site Plant Control System construction work. The individual is to be on-site during all times when Plant Control System work is being done.

B. The system, peripherals, and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings unless otherwise approved by the Engineer.

C. All work shall be executed in full accordance with all applicable codes and local rulings. Should any work be performed contrary to said rulings, ordinances, or regulations, the System Manufacturer shall bear the full responsibility for such violations and assume all costs arising therefrom.

D. The Contractor shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall ship the equipment in sections sized to permit passage through such areas.

3.02 System Noise Rejection

A. Electrical isolation shall be provided between input systems and the processor units. Noise rejection for common mode shall be at least 100 decibels from 0 to 100 Hertz, and up to 175 volts. Normal voltage rejection shall be not less than 35 decibels at 60 Hertz.

B. All instrument signal wiring, control wiring, and AC control power wiring shall be protected against lightning, spikes, and other transient surges at all field and control panel termination points per the requirements of Section 17120.

3.03 Grounding

A. Bond all instrument and control panel enclosures to the power system ground.

B. Ground analog signal conductor shields at the control panel end only.

3.04 Tests and Acceptance

A. The equipment and programs shall be factory-tested prior to shipment for compliance with the conditions of this Section, these Specifications, and for environmental conditions.

B. Factory Testing: Factory-test setup shall demonstrate peripheral performance, including all displays and graphics. All discrete and analog points shall be verified. A 100-hour burn-in test shall be performed on all solid-state devices. The Owner reserves the right to witness the factory tests. At least 20 days written notice shall be given to the Owner and the Engineer by the Contractor prior to the date of starting factory tests. Submit detailed witness test and final checkout procedural outlines for approval to the Engineer not less than 60 days prior to starting factory tests. Testing shall include the complete system with all cabinet doors in place and peripherals attached, for an agreed to period time, with documentation via periodic printouts.

C. After installation of the complete system, the System Manufacturer shall provide the services of a qualified systems engineer to test the complete system under the observation of the Owner or Owner's representative to verify that all functions specified are performed without error or malfunction. As a part of the test procedure, Contractor's personnel, when requested by the system supplier, shall cause each remote process to change state or value three times to verify all functions during the checkout period. This shall be repeated until the system performs correctly to the satisfaction of the Owner or Owner's representative.

3.05 Start-Up Assistance

The System Manufacturer shall provide the on-site services of a project engineer for a minimum of six days (6 days at 8-hours per day, 3 days at each site) for start-up assistance. The individual provided shall be familiar with the Project and with all software packages and supplied hardware. This individual shall be capable of modifying PLC programming or operator interface configuration during the start-up period.

3.06 Training

A. The cost of training programs shall be included in the Control Price. The training and instruction shall be directly related to the Plant Control System being supplied.

B. The System Manufacturer shall provide the following training courses for designated Owner's personnel. All course materials required to adequately support the material presented shall be included. The System Manufacturer shall set the schedule for all courses with the Owner at least 20 days prior to the proposed date.

1. Pump Station Control Overview

    a. Length: Four hours

    b. Number of Students: 5

    c. Location: Owner's plant site

    d. This course will familiarize students with the pump station control system and will explain the control logic along with monitoring and alarming, both locally and remotely.

END OF SECTION

SECTION 17100

CONTROL PANELS

PART 1 - GENERAL

1.01 Scope

Control panels.

1.02 Submittals

A. The Contractor shall furnish the following items from the System Manufacturer for approval prior to fabrication:

1. Layout drawings of the front of the panel showing mounting dimensions for all instruments and associated hardware.

2. Assembly drawings shall include:

a. Details of panel fabrication including outline dimensions and locations of rear of panel mounted equipment.

b. Wiring layout.

c. Wiring and tubing interconnection diagrams.

3. Electrical wiring and termination drawings.

4. Complete bill of materials describing all panel components, including manufacturer ands complete model number for all components.

5. Catalog cut sheets for all panel components.

1.03 Record Drawings

Submit shop drawings as listed under Article 1.02 above plus operation and maintenance information.

1.04 Delivery, Storage, and Handling

A. Wrap the completed panel in polyethylene plastic and crate in a wooden shipping crate with sufficient packing to avoid damage in shipment.

B. Support the base of the shipping crate with the cross members of sufficient strength and clearance to allow movement of the entire crated panel by fork-

lift truck.

PART 2 - PRODUCTS

2.01 Enclosure

A. Provide wall mounted, stanchion mounted, free-standing, or walk-in enclosures as scheduled.

B. Provide NEMA 12 enclosures for control panels located indoors and NEMA 4X stainless steel for outdoor locations (except walk-in) unless otherwise noted.

C. In all NEMA 4X enclosures, provide a thermostat-controlled space heater and corrosion inhibitor blocks. Provide NEMA 4X rated devices on front of enclosure or mount devices on interior panel and provide door mounted tempered glass or polycarbonate viewing window.

D. Free-standing enclosures are a minimum of 20-inches deep.

E. NEMA 12 and general purpose enclosures shall be fabricated from a minimum 14 gauge steel, unless noted otherwise, with all seams ground smooth, all corners rounded, and all flat surfaces smooth with no ripples, dimples, or surface imperfections and no screws, bolts, or nuts visible from outside. Provide panel stiffeners as required to provide a rigid, non-bowing surface. Thoroughly clean and degrease the steel shell before painting. Apply one coat of a rust inhibiting primer and two coats of air dry enamel or acrylic with flattening agent to produce a smooth semi-gloss finish. Colors are to be chosen by the Engineer.

F. Install a continuous hinged front access door. For freestanding enclosures, furnish a three-point latch. A single point latch is acceptable for wall-mounted enclosures. Wire door mounted instruments and controls to stationary components with suitable flexible connections and protection where wiring crosses the hinge. Provide double or multiple doors as required for stability and smooth mechanical operation.

G. Terminate all tubing and electrical connections at the bottom of the panel to bulkhead fittings and terminal strips, with all external connections properly identified for field connections. Space shall be provided at the bottom of the panel for excess wiring to be laid out before landing on the associated field terminal strip. Space shall also be provided at the top and sides of the panel for routing cables entering from the top of the panel.

H. For panels with 120 VAC power supply, provide appropriately sized circuit breaker, single pole, 22,000 AIC, mounted in the rear of the panel to

disconnect power. Mount an engraved nameplate (white letters, red background) to read “WARNING – This panel energized by foreign control power sources. Equipment will be live with panel disconnect in either on or off position”.

I. Internal panel sub-feeds of 120 VAC power shall be divided into separate circuits protected by properly sized circuit breakers or fuses. The following separate circuit divisions shall be provided:

1. Panel light(s) and panel fans (where used).

2. Each receptacle.

3. Power to the panel UPS (where supplied).

4. Thermostatically controlled heaters (where supplied).

5. Each power supply (including 24-volt power supplies, power supplies for PLCs, power supplies for fiber optic transceivers, etc.)

6. 120-volt power to field mounted instruments (each instrument shall be provided with a separate circuit).

J. Provide copper ground bus bar(s) in the rear of the panel. All bus bars shall be bonded together. Ground bus shall be capable of accepting System Ground Grid connection and Power System Ground connection.

K. Provide 20 percent spare, contiguous panel/sub-panel mounting area to accommodate future panel expansion, unless noted otherwise.

L. The System Manufacturer shall investigate the space allocated for control panels on the accompanying drawings and inform the Engineer of any potential problems.

M. If indicated in the control panel schedule, control panels shall be provided with a drip shield or heat shield.

1. A 304 stainless steel drip shield shall be provided to prevent ice buildup on the panel door, door hinges, and front of panel-mounted devices. Minimum overhang shall be one inch on the front and side of the panel.

2. 304 stainless steel heat shields shall be provided to prevent excess heat inside the panel. Shields shall be provided for the top, front, back, and both sides of the panel. Shields shall be mounted to provide one-inch air space between the shield and the panel. Each shield shall have the same height and width as the panel side being protected. Cutouts

shall be provided for access to front of panel-mounted devices.

N. All indicator lights shall be push-to-test. In cases where it is not practical to use push-to-test indicator lights (Engineer's approval required), then a lamp test circuit with a lamp test pushbutton mounted on the front-of-panel shall be provided. Pressing the lamp test pushbutton shall illuminate all indicator lights without interrupting control circuits.

Lamp Colors:	Red	Stopped, Off, Closed
	Green	Running, Open
	Amber	Alarm

O. Provide one 120 VAC duplex receptacle and fluorescent light(s) as scheduled. Incandescent lights may be used where panel size prohibits the use of fluorescent lights. Provide one standard on/off light switch for the lights. Receptacles and lights shall be provided with a separate circuit breaker and shall be fed from the 120 VAC power supply to the panel. Receptacles and lights shall be fed from uninterruptible power supplies.

P. All PLC discrete outputs shall have interposing relays installed in the control panel.

Q. Where Intrinsic Safety (IS) barriers have been supplied as a means of providing electrical hazardous area protection for the associated field device, all IS barriers and associated IS wiring shall be separated by at least two inches of air space from all regular non-hazardous wiring inside the control panel. Per NEC Article 504-30, grounded metal or other insulated partitions with lesser distance requirements shall be permitted. IS wiring entering the control panel shall be located in dedicated conduits, which also shall be separated from any non-hazardous wiring. IS Barriers shall be located in electrical non-hazardous areas.

R. Conduits containing IS wiring where entering enclosures containing regular, non-IS wiring shall be externally sealed to prevent transmission of gases from hazardous areas. Conduit installation and sealing is to be provided under Division 16.

S. All FRP panels located in direct sunlight shall be provided with at least two coats of UV protective coating to prevent discoloration and cracking.

T. All control panels shall be either padlockable or have a lock installed in the door handle. All Contractor provided locks shall be keyed alike – consult with the Owner for preferred keying system.

U. Front of panel devices, such as analog controllers or annunciators, that have rear mounted terminal strips shall be accessible without standing inside the

control panel (i.e. mounted on panel door or swing-out panels). Walk-in control panels are accepted.

2.02 Wiring

A. Install a minimum of #16 AWG copper stranded, 600 volt, extra flexible type for all control wiring 50 volts and above, and a minimum of #18 AWG twisted, shielded pair for analog signal conductors. Color code wires as follows:

1. Ground: Green.

2. Neutral: White.

3. Line Conductor (150 volts or less to ground): Black.

4. Control (150 volts AC or less): Red.

5. Control (150 volts DC or less): Blue.

6. Interlock control circuits supplied from external power source: Yellow or pink.

7. Intrinsic Safety Conductors: Light blue.

8. Signal Shielded and Special Cables: Identify with wire markers.

B. Mark all wires with approved wire markers at all terminations, per Section 16195. Clearly mark all terminal blocks with typewritten or ink markings. Label all devices mounted on the steel sub-panel. All instrument and control devices (current switches, MiniCAS II relay modules, etc.) located inside control panels shall have engraved lamacoid nametag affixed on or near the device and shall bear the tag number and service description. Label all devices mounted on the panel front with engraved lamacoid nameplates, fastened with screws. Nameplates shall be three-layer laminated plastic, black letters on a white background. Letter height to be 1/8-inch for individual devices and 1/4-inch for panel designation.

C. Neatly bundle and secure all wiring with plastic ties. Route back-of-panel wiring in slotted plastic wireways with snap-on covers.

D. Terminal blocks shall be provided for all field wiring connections to the panel. This includes shield terminals for shielded cables. Terminal blocks may be mounted horizontally or vertically and shall be easily accessed from panel door(s). Terminal blocks shall be DIN rail mounted, screw clamp, feed-through type with 600-volt minimum rating. A minimum of 20 percent extra

terminals shall be provided on the terminal blocks. Each terminal shall be clearly and permanently marked. Provide fused terminal blocks for all 120 VAC discrete inputs and outputs. All terminal blocks shall be suitably sized for #12 AWG (minimum) stranded wire. All terminal blocks shall be grouped apart, depending upon type of signal per Paragraph E below.

E. AC or DC power wiring shall not run in any raceway with any type of instrument wiring. Wiring is to be divided into categories and shall be carried in separate raceways. The minimum acceptable groupings are:

1. 120 VAC, 60 Hz AC power wiring and chart drive power wiring.

2. DC power to electronic instruments (does not include loop powered instruments), contact closure input and output wiring.

3. All wiring carrying pulsed information.

4. Standard range analog DC signals, thermocouple and up to 200 mV DC signals.

5. All intrinsic safe wiring.

F. It is the responsibility of the System Manufacturer to provide appropriate protection against transients and surges for all field wiring, interfacing with the control panels. This protection equipment shall reside in the appropriate control panel. All instrument analog signal wiring, data transmission wiring, and 120 VAC power supply wiring shall be protected against lightning strikes, and other transient surges at all control panel termination points. All control power wiring, AC control power wiring, I/O cabinet discrete input wiring and discrete output wiring which is routed outside of buildings shall be protected against lightning strikes, and other transient surges at all control panel termination points. Lightning and surge devices shall protect the system from induced surges in analog, discrete and control circuitry and power supply lines. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding. Protection devices for all internally mounted power supplies shall be installed on individual 120 VAC supply wiring. Each surge/lighting protector shall be independently grounded to the panel ground bus. Protector mounting rail shall not be used to ground the protector.

G. The System Manufacturer shall provide required hardware and labor for termination of new signals in existing termination cabinets where required. This hardware and workmanship shall match existing work with respect to method, materials, and workmanship.

H. All control panels furnished under this Section shall carry a UL label which certifies the control panel meets the requirements of UL-508A (latest version).

2.03 Drawings

A. Panel Construction Drawings

1. Shop Drawings and Catalog Cuts: Provide detailed shop drawings and catalog cuts for all panels, instrument racks, and enclosures. Drawings shall show the location of all front panel and internal sub-panel mounted devices to scale and shall include a panel legend and bill of materials. Layout drawings shall show all major dimensions as well as elevations, in inches from the base up, of all rows of components.

2. The panel legend shall list and identify all front of panel devices by their assigned tag numbers, all nameplate inscriptions, service legends, and annunciator inscriptions. Tag number shall be as listed in the Specifications and Drawings.

3. The bill of materials shall include all devices, including those mounted within the panel that are not listed in the panel legend, and shall include the device tag number, description, manufacturer, and complete model number.

B. Panel Wiring Diagram

1. Provide complete terminal identification of all external primary elements, panels, and junction boxes that interface directly to the panel wiring being shown. Polarity of analog signals shall be shown at each terminal.

2. All external wiring that the electrical contractor must provide and install shall be shown as a dashed line. Special cables that are provided with the instrument shall be clearly identified.

3. Panel wiring diagrams shall identify wire numbers and types, terminal numbers, and tag numbers. Wiring diagrams shall show all circuits individually; no common diagrams will be allowed.

4. Provide panel power wiring diagrams for all panels. The diagrams shall include the grounding requirements.

C. Interconnecting Wiring Diagrams: Diagrams shall show all component and termination cabinet identification numbers and external wire, fiber, and cable numbers. This diagram shall be coordinated with the electrical supplier and

shall bear its mark showing that this has been done.

2.04 Control Panel Schedule

Panel No.	Location	Mounting Type	Enclosure Rating	Light/Receptacle	Heat Shield/ Drip Shield
PCP-1	Kensington Road Pump Station	Free-Standing	NEMA 4X	Yes / Yes	No/No
RTU-A	Kensington Road Pump Station	Unistrut Mounted	NEMA 4X	Yes/No	No/No

PART 3 - EXECUTION

3.01 Testing and Calibration

A. Thoroughly shop test the completed panel. Confirm that all lamps burn. Remove, box, and label all parts that may come loose or detached in shipment, so that after installation they may be easily replaced.

B. Perform preliminary calibrations in the fabricator's shop, and final calibrations at start-up by qualified personnel.

END OF SECTION

SECTION 17120

SURGE PROTECTION

PART 1 - GENERAL

1.01 Scope

Comprehensive surge protection for all instrumentation devices supplied as part of these Specifications.

1.02 General

A. It is the responsibility of the System Manufacturer to provide appropriate protection against transients and surges for all field instruments, field wiring, and devices interfacing with control panels. All instrument signal wiring, control wiring, telephone wiring, and data transmission wiring which enters or exits buildings shall be protected against lightning strikes, and other transient surges at all control panel termination points. All instrument signal wiring, control wiring, telephone wiring, and data transmission wiring which terminates out-of-doors shall be protected against lightning strikes, and other transient surges at all termination points. All AC control power wiring shall be protected against lightning strikes, and other transient surges at all control panel termination points. Lightning and surge devices shall protect the system from induced surges in analog, discrete, and control circuitry and power supply lines. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding.

B. All field instruments located indoors or out-of-doors provided by the System Manufacturer under this contract shall be supplied with surge protection for 120 VAC power to the instrument.

C. Surge protectors shall include a combination of surge suppression technologies including metal oxide varistors, gas discharge tubes, diodes, and 3AG size fuses for line-to-line and line-to-ground protection.

1.03 Submittals

Submit detailed product data.

PART 2 - PRODUCTS

2.01 Field Instruments – Analog Signals

A. Loop Powered Analog Instruments: All signal powered analog field instruments located outside shall be equipped with direct mounted surge protectors which screw directly into the unused conduit entry hub or a conduit tee. Acceptable Manufacturer: Phoenix Contact Model S-PT1-2PE-24VDC

B. Field Powered Analog Instruments: All field powered analog instruments located outside shall be equipped with surge protectors for both signal and power, mounted in a NEMA 4X enclosure. Acceptable Manufacturer: Phoenix Contact BOXTRAB with individual protection for signal and power circuits.

2.02 Control Panels

A. All instrument analog signal wiring which enters or exits buildings or which terminates out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT 1X2 Series.

B. All instrument discrete signal wiring which enters or exits buildings or which terminates out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT 2X1 Series (Inputs) and PT 2-PE/S Series (Outputs).

C. All data transmission wiring which enters or exits buildings or which terminates out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT HF Series and D-UFB Series.

D. All 120 VAC power wiring to control panels whether located indoors or out-of-doors shall be individually protected against lightning strikes and other transient surges at all control panel termination points. Acceptable Manufacturer: Phoenix Contact PT 2-PE/S Series.

E. Surge protection shall be provided for all telephone connections. Acceptable Manufacturer: Phoenix Contact MT-2FM-RJ12 Series.

2.03 Antennas

RF Surge protection shall be provided for all antennas. Acceptable Manufacturer: Phoenix Contact COAXTRAB Series.

2.04 Ethernet

Surge protection shall be provided for all Ethernet connections. Acceptable Manufacturer: Phoenix Contact D-LAN Series.

2.05 Miscellaneous Digital Equipment

Provide surge protection for all computers, printers, uninterruptible power supplies, digital equipment power supplies, PLCs, fiber optic modems, telephone modems, digital signal converters, and other miscellaneous digital hardware to include communications wiring and 120 VAC power supply wiring for each device. Acceptable Manufacturer: Phoenix Contact.

PART 3 - EXECUTION

3.01 Installation

A. Install all surge protection equipment in strict accordance with manufacturer's guidelines.

B. For surge protectors located out-of-doors and for antenna surge protectors, surge protector grounding shall use individual ground rods located as close to the surge protector as possible. The grounding conductor shall be sized in accordance with manufacturer's recommendations and be routed via the shortest path possible. Bends in the grounding conductor shall be avoided. If bends in the grounding conductor are unavoidable then the number of bends shall be kept to an absolute minimum.

C. Provide installation for all field mounted surge protection equipment. Provide for all wiring terminations for surge protection equipment.

D. If a particular piece of equipment is protected by two surge protectors in series, ensure that the resulting equipment protection is not diminished.

END OF SECTION

SECTION 17200

CONTROL DEVICES

PART 1 - GENERAL

1.01 Scope

General purpose control components for control panels.

1.02 Submittals

Submit product data.

PART 2 - PRODUCTS

2.01 General Purpose Control Components

A. Manual Operators: 30.5 mm, heavy duty, NEMA 4X; industrial grade pushbuttons and selector switches with octagonal ring; contacts rated 10 amps continuous, 6 amps break at 120 VAC. Provide flush head for “start” pushbuttons, extended head for “stop” pushbuttons, and spring return for “jog” selector switches.

B. Pilot Lights: 30.5 mm, heavy duty, NEMA 4X, push-to-test; industrial grade transformer type pilot light with octagonal ring; 6 volt LED lamp.

C. Elapsed Time Indicators: Six-digit, hour, non-reset, 3-1/2-inch square case; equal to Yokogawa Type 240.

D. Acceptable Manufacturers: Allen-Bradley, Cutler-Hammer, General Electric, or Square D.

2.02 Relays

A. Relays which interface with motor controls shall be heavy duty industrial grade; 600 volt; contacts rated 10 amps continuous, 6 amps break (5 and 3 amps respectively for time delay forms); 120 VAC; convertible contacts; coils suitable for continuous duty. Relays shall be manufactured by Allen Bradley, General Electric, or Square D.

B. Non-motor control relays shall be double pole relay contacts, rated 10 amps at 120 VAC. Interposing relays for PLC discrete outputs may be single pole. Coil duty shall be continuous, with coil voltage suitable for application. Open contact breakdown voltage shall be 500 volts rms. Provide with polycarbonate dust cover, DIN rail mount socket and holddown spring. The

unit shall have a minimum expected life of 100,000 operations at rated loads. Provide SPDT, DPDT or 4PDT as required. Relays shall be equal to Potter & Brumfield, Type KAP or KUP.

END OF SECTION

SECTION 17300

INSTRUMENTATION DEVICES

PART 1 - GENERAL

1.01 Scope

A. Primary elements.

B. Transmitters.

C. Receivers.

D. Analytical instruments.

1.02 System Description

A. System consists of all field and panel mounted instrumentation devices as noted, complete with all necessary signal converters, isolators, amplifiers, power supplies, and other appurtenances necessary for interfacing with other components.

B. Except as noted, scale all indicators in engineering units.

1.03 Submittals

Submit product data.

PART 2 - PRODUCTS

2.01 Flow Transmitter – Magnetic – Submergence Rated

A. Type: Pulsed DC coil.

1. Flanged Type (for line sizes 8” and up).

2. Wafer type (for line sizes less than 8”) unless scheduled otherwise.

3. Submergence Rated: The flow tube shall be rated for continuous submergence to 30 feet (IP68).

B. Body

1. Flanged Tube: Short form design, carbon steel ANSI 150 flanges.

2. Wafer Type: Designed to mount between ANSI 150 flanges (provided by others) unless scheduled otherwise. Flowmeter housing shall be manufacturer's standard material of construction.

C. Electrodes: High impedance type, 316 stainless steel unless scheduled otherwise.

D. Grounding Rings: As required by schedule, 316 stainless steel unless scheduled otherwise.

E. Transmitter

1. Power: 120 VAC.

2. Enclosure: NEMA 4, coated cast aluminum or fiberglass.

3. Mounting Bracket: 2-inch pipe.

4. Local Indicator: Included.

5. Cabling: Sufficient to connect flow element and transmitter. Transmitters may be remotely mounted inside buildings.

6. Output: 4-20 mADC.

7. Accuracy: ± 1.0 percent of flow rate.

F. Schedule

Tag	Meter Size	Calibrated Range	Display Scale Units	Liner Material	Max Temp/ Press	Grnd Rings Reqd	Location/ Area Class
FE/FIT-A	6”	11-2600 GPM	GPM	Teflon	85 Deg.F/ 200 PSIG	Yes	Unclassified

G. Acceptable Manufacturer: Endress+Hauser Proline Promag P 300 or Equal.

2.02 Level Switch - Float

A. Type: Submersible impact and corrosion resistant ABS body; non-mercury

switch, contact rated 13 A / 120 VAC; SPDT contact configuration. Mercury float switches are unacceptable.

B. Cable: 16 gauge, 2 or 3 conductor, SJOW oil resistant, CPE. Provide sufficient length for mounting at the elevations indicated.

C. Junction Box: Provide NEMA 4X stainless steel junction box, mounted near the switch (must be mounted outside hazardous area) for terminating vendor supplied cable and discrete control wiring to control panel.

D. Switch Mounting: The System Manufacturer shall provide 3/4 or 1 inch Schedule 40, 316 stainless steel pipe or 1/4-inch cable for mounting the floats for a particular tank or well. The pipe shall extend from two feet above the highest switch setting (up to the top of the vessel) to two feet below the lowest level setting (down to the vessel bottom) for the vessel or well and allow for adjustment of the switch or switches anywhere along the length of the pipe. The method for fixing the float to the pipe shall be easily adjustable and shall provide for protection and strain relief for the float switch cable. Provide a minimum of two mounting brackets for fixing the pipe to the vessel wall while maintaining appropriate standoff distance. The System Manufacturer shall ensure mounting is in accordance with the manufacturer's recommendations.

E. Intrinsically Safe Barriers: Provide manufacturers recommended intrinsically safe barriers for hazardous areas where scheduled below.

F. Schedule:

Tag	Contracts Required	Level Sensor Setpoint Elevation	Sensor Area Classification
LSL-1	Normally Open and Normally Closed	Coordinate with Mechanical	Class I, Division 1, Group D
LSH-1	Normally Open and Normally Closed	Coordinate with Mechanical	Class I, Division 1, Group D
LSHH-1	Normally Open and Normally Closed	Coordinate with Mechanical	Class I, Division 1, Group D
LSH-V	Normally Open and Normally Closed	Coordinate with Mechanical	Class I, Division 1, Group D

G. Acceptable Manufacturers: Gems/Warrick Controls Series M or ITT Flygt ENM-10.

2.06 Level Transmitter – Submersible Pressure Transducer

A. Type: Loop powered liquid level transmitter based upon pressure.

B. Probe

1. Type: Guided coax or rope, 316 SS.

2. Length: As required to reach control panel without splicing

3. Mounting: Provide probe end mounting kit as required to stabilize the probe.

C. Transmitter

1. Output: 4-20 mADC.

2. Power: Two-wire, 24 VDC.

3. Mounting: 4” flange, 316 SS. Provide optional weather protection cover.

4. Cabling: N/A.

5. Enclosure: Cast aluminum, NEMA 4X.

6. Local Indication: Two-line, 8 character LCD with 3-button keypad.

D. Schedule

Tag	Cable Length	Mounting Connection	Area Classification
PT-1	As required to reach control panel without splicing	Stainless steel hangar and support cable, see detail in electrical drawings	Class 1, Division I, Group D

E. Acceptable Manufacturers: Endress + Hauser (Levelflex M).

PART 3 - EXECUTION

3.01 Installation

A. Locate field instruments so they are accessible for maintenance and orient so that indicators are readily visible. Unless otherwise indicated, mount instruments 36 to 60-inches above work surface. Provide 2-inch diameter, 304 stainless steel, Schedule 10 pipe welded to a 10-inch square by 1/4-inch thick stainless steel base plate for support unless wall or other mounting arrangement is indicated. Space instruments at least 1/2-inch off concrete walls by stainless steel channels or phenolic spacers.

B. Provide stainless steel or aluminum sun shields for all electronic instruments located outdoors.

C. Provide stainless steel identification tags attached with stainless steel wire or screws for all field instruments. Tag numbers shall be 1/4-inch high, stamped.

3.02 Tests and Calibration

A. Perform continuity and insulation resistance tests on instrumentation conductors in accordance with Section 16120.

B. Calibrate each instrument to its published accuracy. Submit calibration sheets including the instrument tag number or name, the date, name of individual performing calibration, procedures and equipment used, and results obtained.

END OF SECTION

SECTION 17950

INSTRUMENTS INSTALLATION

PART 1 - GENERAL

1.01 Scope

This Section includes details of fabrication and installation for certain instrumentation hardware items.

PART 2 - PRODUCTS

2.01 Instrumentation Hardware

Refer to Instrument Installation Details.

PART 3 - EXECUTION

3.01 Installation

A. Install and align instruments in accordance with vendor instruction manuals and the Installation Details. Locate all field instruments so as to be accessible for maintenance.

B. Install all field mounted instruments having indicators so as to make the scale visible from the adjacent operating area. Rotate indicating portions of instrumentation, as necessary, to improve visibility from the operating area.

C. Provide sufficient clearances for access and instrument servicing.

D. Space instruments at least 1-inch off walls using stainless steel channels.

E. Mount all field instruments securely, using manufacturer mounting yoke, when furnished, on a pipe stand, to ensure a rigid, vibration-free installation.

F. Locations of instruments shown on the Drawings are approximate. The Contractor may, at the Contractor's discretion, relocate instruments to more appropriate positions within five feet of the location shown on the Drawings.

G. Provide and install any necessary tubing raceways, supports, and tie downs.

H. Install tubing and fittings in a neat, professional manner, to assure proper instrument operation.

I. Provide all electronic instruments which are located out-of-doors with

adequate sunscreens.

END OF SECTION