

INVITATION TO BID
PROPOSAL

BID NO. 12-0014-4

LAROCHE AVENUE CULVERT

PREBID CONF: 2:00PM, MARCH 7, 2012
MANDATORY ATTENDANCE

BID OPENING: 2:00PM, MARCH 21, 2012

THE COMMISSIONERS OF CHATHAM COUNTY, GEORGIA

PETE LIAKAKIS, CHAIRMAN

COMMISSIONER HELEN J. STONE

COMMISSIONER HARRIS ODELL JR.

COMMISSIONER JAMES J. HOLMES

COMMISSIONER DAVID M. GELLATLY

COMMISSIONER PATRICK O. SHAY

COMMISSIONER DEAN KICKLIGHTER

COMMISSIONER PATRICK J. FARRELL

COMMISSIONER PRISCILLA D. THOMAS

R. JONATHAN HART, COUNTY ATTORNEY

CHATHAM COUNTY, GEORGIA
DOCUMENT CHECK LIST

The following documents, when marked, are contained in and made a part of this Bid Package or are required to be submitted with the bid. It is the responsibility of the bidder to read, complete and sign, where indicated, and return these documents with his/her bid. **FAILURE TO DO SO MAY BE CAUSE FOR DISQUALIFYING THE BID.**

☒ GENERAL INFORMATION AND INSTRUCTIONS TO BID WITH ATTACHMENTS

☒ SURETY REQUIREMENTS (A Bid Bond of 5% with this ITB)

☒ PROPOSAL

☐ PLANS/DRAWINGS - Plans and specifications must be purchased at Clayton Digital Reprographics by logging into www.cdrepro.com. Login to DFS. New users must register. For technical support contact Roger Oliver at (912) 352-3880, fax (912) 352-3881 or email: cdrsouth@cdrepro.com.

☒ BID SCHEDULE

☐ PERFORMANCE BOND - UPON AWARD OF CONTRACT

☐ PAYMENT BOND - UPON AWARD OF CONTRACT

☐ CONTRACT

☒ LEGAL NOTICE

☒ ATTACHMENTS: A. DRUG FREE WORKPLACE; B. NONDISCRIMINATION STATEMENT; C. DISCLOSURE OF RESPONSIBILITY STATEMENT; D. CONTRACTOR/SUBCONTRACTOR AFFIDAVIT & AGREEMENT; E. DEBARMENT CERTIFICATION; F. CAP AGREEMENT; G. M/WBE PARTICIPATION COMPLIANCE REPORT; H. *SAVE* AFFIDAVIT.

☐ DOCUMENTATION OF ABILITY TO PERFORM BID REQUIREMENTS. THIS MAY BE REQUIRED OF BIDDERS AFTER SUBMISSION OF BIDS.

COUNTY TAX CERTIFICATE REQUIREMENT - Contractor must supply a copy of their Tax Certificate from their location in the State of Georgia, as proof of payment of the occupational tax where their office is located.

CURRENT TAX CERTIFICATE NUMBER

CITY _____

COUNTY _____

OTHER _____

The Chatham County of Commissioners have established goals to increase participation of minority and woman owned businesses. In order to accurately document participation, businesses submitting bids or proposals are encouraged to report ownership status. A minority or woman business is defined as a business with 51% or greater minority of woman ownership. Please check ownership status as applicable:

African-American _____ Asian American _____ Hispanic _____

Native American or Alaskan Indian _____ Woman _____

In the award of "Competitive Sealed Proposals", minority/woman participation may be one of several evaluation criteria used in the award process when specified as such in the Request for Proposal.

RECEIPT IS HEREBY ACKNOWLEDGED OF ADDENDA NUMBERS _____

The undersigned bidder certifies that he/she has received the above listed and marked documents and acknowledges that his/her failure to return each, completed and signed as required, may be cause for disqualifying his/her bid.

BY: _____
DATE

SIGNATURE

TITLE: _____

COMPANY: _____

CHATHAM COUNTY, GEORGIA
OFFICE OF THE PURCHASING AGENT
1117 EISENHOWER DRIVE, SUITE C
SAVANNAH, GEORGIA 31406
(912) 790-1622

Date: February 15, 2012

BID NO. 12-0014-4

GENERAL INFORMATION FOR INVITATION FOR BID/PROPOSAL

This is an invitation to submit a bid or proposal to supply Chatham County with construction, equipment, supplies and/or services as indicated herein. Sealed bids or proposals will be received at the Office of the Purchasing Agent, **at The Chatham County Citizens Service Center, 1117 Eisenhower Drive, Suite C, Savannah, Georgia, up to 2:00PM, MARCH 21, 2012** at which time they will be opened and publicly read. **The County reserves the right to reject all bids or proposals for any bid or proposal that is non-responsive or not responsible.**

Instructions for preparation and submission of a bid or proposal are contained in this Invitation For Bid/Proposal package. Please note that specific forms for submission of a bid/proposal are required. Bids must be typed or printed in ink. If you do not submit a bid/proposal, return the signed bid invitation sheet and state the reason; otherwise, your name may be removed from our bidders list.

A MANDATORY pre-bid conference has been scheduled to be conducted **and held at The Chatham County Citizens Service Center, 1117 Eisenhower Drive, Suite C, Savannah, Georgia, at 2:00PM, MARCH 7, 2012** to discuss the specifications and resolve any questions and/or misunderstanding that may arise. **Your firm must be represented at this conference to be allowed to submit a bid for this project.**

Any changes to the conditions and specifications must be in the form of a written addendum to be valid; therefore, the Purchasing Agent will issue a written addendum to document each approved change. Generally when addenda are required, the bid opening date will be changed.

Chatham County has an equal opportunity purchasing policy. Chatham County seeks to ensure that all segments of the business community have access to supplying the goods and services needed by County programs. The County affirmatively works to encourage utilization of disadvantaged and minority business enterprises in our procurement activities. The County provides equal opportunity for all businesses and does not discriminate against any persons or businesses regardless of race, color, religion, age, sex, national origin or handicap. The terms "disadvantaged business," "minority business enterprise," and "minority person" are more specifically defined and explained in the Chatham County Purchasing Ordinance and Procedures Manual, Article VII - Disadvantaged Business Enterprises Program.

This project is Special Purpose Local Option Sales Tax (SPLOST) Project. See paragraph 2.22 for MBE/WBE participation goals.

INSTRUCTIONS TO BIDDERS/PROPOSERS

1.1 **Purpose:** The purpose of this document is to provide general and specific information for use in submitting a bid or proposal to supply Chatham County with equipment, supplies, and/or services as described herein. All bids/proposals are governed by the Code of Chatham County, Chapter 4, Article IV, and the laws of the State of Georgia.

1.2 **How to Prepare Bid Proposals:** All bid proposals shall be:

- a. Prepared on the forms enclosed herewith, unless otherwise prescribed, and **all documents must be submitted.**
- b. Typewritten or completed with pen and ink, signed by the business owner or authorized representative, with all erasures or corrections initialed and dated by the official signing the proposal. **ALL SIGNATURE SPACES MUST BE SIGNED.**

Bidders are encouraged to review carefully all provisions and attachments of this document prior to submission. Each bid constitutes an offer and may not be withdrawn except as provided herein.

1.3 **How to Submit Bid Proposals:** All bid proposals shall be:

- a. **Submitted in sealed opaque envelopes, plainly marked with the bid number and title, date and time of bid opening, and company name.**
- b. Mailed or delivered as follows in sufficient time to ensure receipt by the Purchasing Agent on or before the time and date specified above.
 1. **Mailing Address: Purchasing Agent, 1117 Eisenhower Drive, Suite C, Savannah, Georgia 31416.**
 2. **Hand Delivery: Purchasing Agent, Chatham County Citizens Service Center, 1117 Eisenhower Drive, Suite C, Savannah, Georgia.**

BIDS NOT RECEIVED BY THE TIME AND DATE SPECIFIED WILL NOT BE OPENED OR CONSIDERED.

1.4 **How to Submit an Objection:** Objections from bidders to this invitation to bid and/or these specifications should be brought to the attention of the County Purchasing Agent in the following manner:

- a. When a pre-bid conference is scheduled, bidders shall either present their oral objections at that time or submit their written objections at least two (2) days prior to the scheduled pre-bid conference.
- b. When a pre-bid conference is not scheduled, the bidder shall submit any objections he may

have in writing not less than five (5) days prior to the opening of the bid.

- c. The objections contemplated may pertain to form and/or substance of the invitation to bid documents. Failure to object in accordance with the above procedure will constitute a waiver on the part of the business to protest this invitation to bid.

- 1.5 **Failure to Bid:** If a bid is not submitted, the business should return this invitation to bid document, stating reason therefore, and indicate whether the business should be retained or removed from the County's bidders list.
- 1.6 **Errors in Bids:** Bidders or their authorized representatives are expected to fully inform themselves as to the conditions, requirements, and specifications before submitting bids. Failure to do so will be at the bidder's own risk. In case of error in extension of prices in the bid, the unit price will govern.
- 1.7 **Standards for Acceptance of Bid for Contract Award:** The County reserves the right to reject any or all bids and to waive any irregularities or technicalities in bids received whenever such rejection or waiver is in the best interest of the County. The County reserves the right to reject the bid of a bidder who has previously failed to perform properly or complete on time contracts of a similar nature, or a bid from a bidder whom investigation shows is not in a position to perform the contract.
- 1.8 **Bidder:** Whenever the term "bidder" is used it shall encompass the "person," "business," "contractor," "supplier," "vendor," or other party submitting a bid or proposal to Chatham County in such capacity before a contract has been entered into between such party and the County.
- 1.9 **Responsible / Responsive Bidder:** *Responsible Bidder* means a person or entity that has the capability in all respects to perform fully and reliably the contract requirements. *Responsive Bidder* means a person or entity that has submitted a bid or proposal that conforms in all material respects to the requirements set forth in the invitation for bids or request for proposals.
- 1.10 **Compliance with Laws:** The bidder and/or contractor shall obtain and maintain all licenses, permits, liability insurance, workman's compensation insurance and comply with any and all other standards or regulations required by federal, state or County statute, ordinances and rules during the performance of any contract between the contractor and the County. Any such requirement specifically set forth in any contract document between the contractor and the County shall be supplementary to this section and not in substitution thereof.
- 1.11 **Contractor:** Contractor or subcontractor means any person or business having a contract with Chatham County. The Contractor/Vendor of goods, material, equipment or services certifies that they will follow equal employment opportunity practices in connection with the awarded contract as more fully specified in the contract documents.
- 1.12 ***Local Preference:** On 27 March, 1998 the Board of Commissioners adopted a Local Vendor Preference Ordinance. This Ordinance does not apply to construction contracts. However, contractors are encouraged to apply the same method when awarding bids to local and local M/WBE businesses when ever possible in order to promote growth in Chatham County's economy. **NOTE: Local Preference does not apply to Public Works Construction contracts.**

- 1.13 **Debarred Firms and Pending Litigation:** Any potential proposer/firm listed on the Federal or State of Georgia Excluded Parties Listing (Barred from doing business) **will not** be considered for contract award. Proposers **shall disclose** any record of pending criminal violations (Indictment) and/or convictions, pending lawsuits, etc., and any actions that may be a conflict of interest occurring within the past five (5) years. Any proposer/firm previously defaulting or terminating a contract with the County will not be considered. Also, any contractor or subcontractor that has pending litigation with the County will not be considered for contract award.

**** All bidders or proposers are to read and complete the Disclosure of Responsibility Statement enclosed as an Attachment to be returned with response. Failure to do so may result in your solicitation response being rejected as non-responsive.**

Bidder acknowledges that in performing contract work for the Board, bidder shall not utilize any firms that have been a party to any of the above actions. If bidder has engaged any firm to work on this contract or project that is later debarred, Bidder shall sever its relationship with that firm with respect to Board contract.

- 1.14 **Performance Evaluation:** On April 11, 2008, the Chatham County Board of Commissioners approved a change to the County Purchasing Ordinance requiring Contractor/Consultant Performance Evaluations, as a minimum, annually, prior to contract anniversary date.

Should Contractor/Consultant performance be unsatisfactory, the appointed County Project Manager for the contract may prepare a Contractor/Consultant Complaint Form or a Performance Evaluation to the County Purchasing Agent.

- 1.15 **Payment of Taxes:** No contract shall be awarded unless all real and personal property taxes have been paid by the successful contractor and/or subcontractors as adopted by the Board of commissioners on April 8, 1994.

- 1.16 **State Licensing Board for General Contractors:** Pursuant to Georgia law, the following types of contractors **must obtain a license from the State Licensing Board of Residential and General Contractors by July 1, 2008:**

* **Residential - Basic Contractor** (Contractor work relative to detached one-family and two-family residences and one-family townhouses not over three stories in height).

* **Residential - Light Commercial Contractor** (Contractor work or activity related to multifamily and multiuse light commercial buildings and structures).

* **General Contractor** (Contractor work or activity that is unlimited in scope regarding any residential or commercial projects).

See Checklist for Submitting Bid (page 22) for the type of license required for this project.

GENERAL CONDITIONS

- 2.1 **Specifications:** Any obvious error or omission in specifications shall not inure to the benefit of the bidder but shall put the bidder on notice to inquire of or identify the same from the County. Whenever herein mention is made of any article, material or workmanship to be in accordance with laws, ordinances, building codes, underwriter's codes, A.S.T.M. regulations or similar expressions, the requirements of these laws, ordinances, etc., shall be construed to be the minimum requirements of these specifications.
- 2.2 **Multiple Bids:** No vendor will be allowed to submit more than one bid. Any alternate proposals must be brought to the Purchasing Agent's attention during the Pre-bid Conference or submitted in writing at least five (5) days preceding the bid opening date.
- 2.3 Not Used.
- 2.4 **Prices to be Firm:** Bidder warrants that bid prices, terms and conditions quoted in his bid will be firm for acceptance for a period of sixty (60) days from bid opening date, unless otherwise stated in the bid.
- 2.5 **Completeness:** All information required by Invitation for Bids/Proposals must be completed and submitted to constitute a proper bid or proposal.
- 2.6 **Quality:** All materials, or supplies used for the construction necessary to comply with this proposal shall be of the best quality, and of the highest standard of workmanship.
- Workmanship employed in any construction, repair, or installation required by this proposal shall be of the highest quality and meet recognized standards within the respective trades, crafts and of the skills employed.
- 2.7 **Guarantee:** Unless otherwise specified by the County, the bidder shall unconditionally guarantee the materials and workmanship on all material and/or services. If, within the guarantee period any defects occur which are due to faulty material and or services, the contractor at his expense, shall repair or adjust the condition, or replace the material and/or services to the complete satisfaction of the County. These repairs, replacements or adjustments shall be made only at such time as will be designated by the County as being least detrimental to the operation of County business.
- 2.8 **Liability Provisions:** Where bidders are required to enter or go onto Chatham County property to take measurements or gather other information in order to prepare the bid or proposal as requested by the County, the bidder shall be liable for any injury, damage or loss occasioned by negligence of the bidder, his agent, or any person the bidder has designated to prepare the bid and shall indemnify and hold harmless Chatham County from any liability arising therefrom. The contract document specifies the liability provisions required of the successful bidder in order to be awarded a contract with Chatham County.
- 2.9 **Cancellation of Contract:** The contract may be canceled or suspended by Chatham County in whole or in part by written notice of default to the Contractor upon non-performance or violation of contract terms. An award may be made to the next low bidder, for articles and/or services specified or they may be purchased on the open market and the defaulting Contractor (or his surety) shall be liable to Chatham County for costs to the County in excess of the defaulted contract prices. See the contract documents for complete requirements.

- 2.10 **Patent Indemnity:** Except as otherwise provided, the successful bidder agrees to indemnify Chatham County and its officers, agents and employees against liability, including costs and expenses for infringement upon any letters patent of the United States arising out of the performance of this Contract or out of the use or disposal for the account of the County of supplies furnished or construction work performed hereunder.
- 2.11 **Certification of Independent Price Determination:** By submission of this bid, the bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, that in connection with this procurement:
- (1) The prices in this bid have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
 - (2) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly to any other bidder or to any competitor; and
 - (3) No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not be submit a bid for the purpose or restricting competition.
- 2.12 **Award of Contract:** The contract, if awarded, will be awarded to that responsible bidder whose bid/proposal will be most advantageous to Chatham County, price and other factors considered. The Board of Commissioners will make the determination as to which bid or proposal that serves as the best value to Chatham County.
- 2.13 **Procurement Protests:** Objections and protests to any portion of the procurement process or actions of the County staff may be filed with the Purchasing Agent for review and resolution. The Chatham County Purchasing Procedures Manual, Article IX - Appeals and Remedies shall govern the review and resolution of all protests.
- 2.14 **Qualification of Business (Responsible Bidder or Proposer):** A responsible bidder or proposer is defined as one who meets, or by the date of the bid acceptance can meet, certifications, all requirements for licensing, insurance, and registrations, or other documentation required by the Design Professional engaged to develop Scope of work, specifications and plans. These documents will be listed in the Special Conditions further on in this solicitation. Chatham County has the right to require any or all bidders to submit documentation of the ability to perform, provide, or carry out the service or provide the product requested.
- Chatham County has the right to disqualify the bid or proposal of any bidder or proposer as being unresponsive or irresponsible whenever such bidder/proposer cannot document the ability to deliver the requested product.
- 2.15 **Chatham County Tax Certificate Requirement:** A current Chatham County Tax Certificate is required unless otherwise specified.

Please contact the Building Safety and Regulatory Services (912) 201-4300 for additional information.

- 2.16 Insurance Provisions, General:** The selected CONTRACTOR shall be required to procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees or subcontractors. The cost of such insurance shall be included in the Bid. It is every contractor's responsibility to provide the County Purchasing and Contracting Division current and up-to-date Certificates of Insurance for multiple year contracts before the end of each term. **Failure to do so may be cause for termination of contract.**

2.16.1 General Information that shall appear on a Certificate of Insurance:

- I. Name of the Producer (Contractor's insurance Broker/Agent).
- II. Companies affording coverage (there may be several).
- III. Name and Address of the Insured (this should be the Company or Parent of the firm Chatham County is contracting with).
- IV. A Summary of all current insurance for the insured (includes effective dates of coverage).
- V. A brief description of the operations to be performed, the specific job to be performed, or contract number.
- VI. Certificate Holder (This is to always include Chatham County).

Chatham County as an Additional Insured: Chatham County invokes the defense of sovereign immunity. In order not to jeopardize the use of this defense, the County **is not** to be included as an Additional Insured on insurance contracts.

2.16.2 **Minimum Limits of Insurance** to be maintained for the duration of the contract:

- a. **Commercial General Liability:** Provides protection against bodily injury and property damage claims arising from operations of a Contractor or Tenant. This policy coverage includes: premises and operations, use of independent contractors, products/completed operations, personal injury, contractual, broad form property damage, and underground, explosion and collapse hazards. Minimum limits: \$1,000,000 bodily injury and property damage per occurrence and annual aggregate.
- b. **Worker's Compensation and Employer's Liability:** Provides statutory protection against bodily injury, sickness or disease sustained by employees of the Contractor while performing within the scope of their duties. Employer's Liability coverage is usually included in Worker's Compensation policies, and insures common law claims of injured employees made in lieu of or in addition to a Worker's Compensation claim. Minimum limits: \$500,000 for each accident., disease policy limit, disease each employee and Statutory Worker's Compensation limit.
- c. **Business Automobile Liability:** Coverage insures against liability claims arising out of the Contractor's use of automobiles. Minimum limit: \$1,000,000 combined single limit per accident for bodily injury and property damage. Coverage should be written on an Any Auto basis.

2.16.3 Special Requirements:

- a. **Claims-Made Coverage:** The limits of liability shall remain the same as the occurrence basis, however, the Retroactive date shall be prior to the coincident with the date of any contract, and the Certificate of Insurance shall state the coverage is claims-made. The Retroactive date shall also be specifically stated on the Certificate of Insurance.
- b. **Extended Reporting Periods:** The Contractor shall provide the County with a notice of the election to initiate any Supplemental Extended Reporting Period and the reason(s) for invoking this option.
- c. **Reporting Provisions:** Any failure to comply with reporting provisions of the policies shall not affect coverage provided in relation to this request.
- d. **Cancellation:** Each insurance policy that applies to this request shall be endorsed to state that it shall not be suspended, voided, or canceled, except after thirty (30) days prior to written notice by certified mail, return receipt requested, has been given to the County.
- e. **Proof of Insurance:** Chatham County shall be furnished with certificates of insurance and with original endorsements affecting coverage required by this request. The certificates and endorsements are to be signed by a person authorized by the insurer to bind coverage on its behalf. All certificates of insurance are to be submitted prior to, and approved by, the County before services are rendered. The Contractor must ensure Certificate of Insurance are updated for the entire term of the County.
- f. **Insurer Acceptability:** Insurance is to be placed with an insurer having an A.M. Best's rating of A and a five (5) year average financial rating of not less than V. If an insurer does not qualify for averaging on a five year basis, the current total Best's rating will be used to evaluate insurer acceptability.
- g. **Lapse in Coverage:** A lapse in coverage shall constitute grounds for contract termination by the Chatham County Board of Commissioners.
- h. **Deductibles and Self-Insured Retention:** Any deductibles or self-insured retention must be declared to, and approved by, the County. At the option of the County, either: the insurer shall reduce or eliminate such deductibles or self-insured retention as related to the County, its officials, officers, employees, and volunteers; or the Contractor shall procure a bond guaranteeing payment of related suits, losses, claims, and related investigation, claim administration and defense expenses.

2.16.4 Additional Coverage for Specific Procurement Projects:

- a. **Professional Liability:** Insure errors or omission on behalf of architects, engineers, attorneys, medical professionals, and consultants.

<u>Minimum Limits:</u>	\$1 million per claim/occurrence
<u>Coverage Requirement:</u>	If claims-made, retroactive date must precede or coincide with the contract effective date or the date of the Notice to Proceed. The professional <u>must state</u> if tail coverage has been purchased and the duration of the coverage.

- b. **Builder's Risk: (For Construction or Installation Contracts)** Covers against insured perils while in the course of construction.

Minimum Limits: All-Risk coverage equal 100% of contract value

Coverage Requirements: Occupancy Clause - permits County to use the facility prior to issuance of Notice of Substantial Completion.

- 2.17 **Compliance with Specification - Terms and Conditions:** The Invitation to Bid, Legal Advertisement, General Conditions and Instructions to Bidders, Specifications, Special Conditions, Vendor's Bid, Addendum, and/or any other pertinent documents form a part of the bidders proposal or bid and by reference are made a part hereof.
- 2.18 **Signed Bid Considered Offer:** The signed bid shall be considered an offer on the part of the bidder, which offer shall be deemed accepted upon approval by the Chatham County Board of Commissioners, Purchasing Agent or his designee. In case of a default on the part of the bidder after such acceptance, Chatham County may take such action as it deems appropriate, including legal action for damages or lack of required performance.
- 2.19 **Notice to Proceed:** The successful bidder or proposer shall not commence work under this Invitation to Bid until a written contract is awarded and a Notice to Proceed is issued by the Purchasing Agent or his designee. If the successful bidder does commence any work or deliver items prior to receiving official notification, he does so at his own risk.
- 2.20 **Payment to Contractors:** Instructions for invoicing the County for products delivered to the County are specified in the contract document.
 - a. Questions regarding payment may be directed to the Finance Department at (912) 652-7905 or the County's Project Manager as specified in the contract documents.
 - b. Contractors will be paid the agreed upon compensation upon satisfactory delivery of the products or completion of the work as more fully described in the contract document.
 - c. Upon completion of the work or delivery of the products, the Contractor will provide the County or contractor with an affidavit certifying all suppliers, persons or businesses employed by the Contractor for the work performed for the County have been paid in full.
 - d. Chatham County is a tax exempt entity. Every contractor, vendor, business or person under contract with Chatham County is required by Georgia law to pay State sales or use taxes for products purchased in Georgia or transported into Georgia and sold to Chatham County by contract. Please consult the State of Georgia, Department of Revenue, Sales and Use Tax

Unit in Atlanta (404) 656-4065 for additional information.

2.21 County's Rights Concerning Award:

The County reserves the right, and sole and complete discretion to waive technicalities and informalities. The County further reserves the right, and sole and complete discretion to reject all bids and any bid that is not responsive or that is over the budget, as amended. In judging whether the bidder is responsible, the County will consider, but is not limited to consideration of, the following:

- (a) Whether the bidder or principals are currently ineligible, debarred, suspended, or otherwise excluded from bidding or contracting by any state or federal agency, department, or authority;
- (b) Whether the bidder or principals have been terminated for cause or are currently in default on a public works contract;
- (c) Whether the bidder can demonstrate sufficient cash flow to undertake the project as evidenced by a Current Ratio of 1.0 or higher;
- (d) Whether the bidder can demonstrate a commitment to safety with regard to Workers' Compensation by having an Experience Modification Rate (EMR) over the past three years not having exceeded an average of 1.2; and
- (e) Whether the bidder's past work provides evidence of an ability to successfully complete public works projects within the established time, quality, or cost, or to comply with the bidder's contract obligations.
- (f) Whether the bidder has made a **Good Faith Effort** to meet local participation goals as set forth herein in Paragraph 2.22.

2.22 The Chatham County Board of Commissioners has adopted an aggressive program that establishes goals for minority/female, small and disadvantaged business participation in construction, professional services, and general procurement.

- a. The Chatham County Board of Commissioners under Georgia law may reject any bid as non-responsive if they feel a bidder did not exercise "**Good Faith Effort**" in obtaining the goal established for M/WBE participation.
- b. The Chatham County Board of Commissioners adopted a policy establishing goals oriented to increase participation of minority and female owned businesses, through MBE/WBE certification and development. In order to accurately document participation, businesses submitting bids, quotes or proposals are encouraged to report ownership status. A bidder or vendor that is certified by any agency of the Federal Government or State of Georgia may submit a copy of their certification with their bid as proof of qualifications. Bidders that intend to engage in joint ventures or utilize subcontractors must submit to the County Contracts Administrator, a report on Minority/Woman Business Enterprise participation.

Goals established for this project is 30% MBE/ WBE combined .

- c. A Minority/Woman Business Enterprise (M/WBE) is a business concern that is at least 51% owned by one or more minority/female individuals (2) and whose daily business operations are managed and directed by one or more of the minority/female owners.

2.23 Bidders or proposers are required to make a **Good Faith Effort**, where subcontracting is to be utilized in performing the contract, to subcontract with or purchase supplies from qualified M/WBEs. Bidders or proposers are required to state if they intend to subcontract any part of the work. Goals will be established for each contract at the onset. **Forms** requiring the signatures of bidders or proposers are enclosed as **Attachments** and must be completed and returned with your bid response. If forms are not completed and submitted, the bid may be considered nonresponsive.

Each bidder or proposer is required to maintain records of such efforts in detail adequate to permit a determination of compliance with these requirements. All contracts will reflect **Good Faith Efforts** and reporting requirements for the term of the contract. The County particularly urges general contractors to give emphasis to subcontracting with local area firms. **For all questions regarding M/WBE participation and Good Faith Effort only, contact : Arneja Riley, Chatham County M/WBE Coordinator, 124 Bull Street, Suite 310 Savannah, Ga. 31401. Ph 912-652-7860; fax 912-652-7849; e-mail alriely@chathamcounty.org or <http://purchasing.chathamcounty.org>**

2.24 **GEORGIA OPEN RECORDS ACT** - The responses will become part of the County's official files without any obligation on the County's part. Ownership of all data, materials and documentation prepared for and submitted to Chatham County in response to a solicitation, regardless of type, shall belong exclusively to Chatham County and will be considered a record prepared and maintained or received in the course of operations of a public office or agency and subject to public inspection in accordance with the Georgia Open Records Act, Official Code of Georgia Annotated, Section 50-18-70, et. Seq., unless otherwise provided by law.

Responses to RFPs shall be held confidential from all parties other than the County until after the contract is awarded by the Board of Commissioners.

The vendor and their bid price in response to IFBs will be read allowed at public bid openings. After Bid Tabulations, the IFB shall be available for public viewing.

Chatham County shall not be held accountable if material from responses is obtained without the written consent of the vendor by parties other than the County, at any time during the solicitation evaluation process.

2.25 **GEORGIA TRADE SECRET ACT of 1990**- In the event a Bidder/Proposer submits trade secret information to the County, the information must be clearly labeled as a Trade Secret. The County will maintain the confidentiality of such trade secrets to the extent provided by law.

2.26 **CONTRACTOR RECORDS**-The Georgia Open Records Act is applicable to the records of all contractors and subcontractors under contract with the County. This applies to those specific contracts currently in effect and those which have been completed or closed for up th three (3) years following completion. Again, this is contract specific to the County contracts only.

2.27 EXCEPTIONS-All proceedings, records, contracts and other public records relating to procurement transactions shall be open to the inspection of any citizen, or any interested person, firm or corporation, in accordance with the Georgia Open Records Act except as provided below:

- a. Cost estimates relating to a proposed procurement transaction prepared by or for a public body shall not be open to public inspection.
- b. Any competitive sealed bidding bidder, upon request, shall be afforded the opportunity to inspect bid records within a reasonable time after the opening of all bids but prior to award, except in the event that the County decides not to accept any of the bids and to rebid the contract. Otherwise, bid records shall be open to public inspection only after award of the contract. Any competitive negotiation offeror, upon request, shall be afforded the opportunity to inspect proposal records within a reasonable time after the evaluation and negotiations of proposals are completed but prior to award except in the event that the County decides not to accept any of the proposals and to reopen the contract. Otherwise, proposal records shall be open to the public inspection only after award of the contract except as provided in paragraph "c" below. Any inspection of procurement transaction records under this section shall be subject to reasonable restrictions to ensure the security and integrity of the records.
- c. Trade secrets or proprietary information submitted by a bidder, offeror or contractor in connection with a procurement transaction shall not be subject to public disclosure under the Georgia Open Records Act; however, the bidder, offeror or contractor must invoke the protections of this section prior to or upon submission of the data or other materials, and must identify the data or other materials to be protected and state the reasons why protection is necessary.
- d. Nothing contained in this section shall be construed to require the County, when procuring by "competitive negotiation" (Request for Proposal), to furnish a statement of the reasons why a particular proposal was not deemed to be the most advantageous to the County.

2.28 DEBARRED OR SUSPENDED SUBCONTRACTORS: CONTRACTOR shall not subcontract, and shall ensure that no subcontracts are awarded at any tier, to any individual, firm, partnership, joint venture, or any other entity regardless of the form of business organization, that is on the Federal Excluded Parties List System (EPLS) at <https://www.epls.gov> or the State of Georgia, DOAS, State Purchasing Exclusion listing. Contractor shall immediately notify County in the event any subcontractor is added to either Federal or State listing after award of the subcontract.

2.29 CONE OF SILENCE:

Lobbying of Procurement Evaluation Committee members, County Government employees, and elected officials regarding this product or service solicitation, Invitation to Bid (ITB) or Request for Proposal (RFP) or contract by any member of a proposer's staff, or those people employed by any legal entity affiliated with an organization that is responding to the solicitation is strictly prohibited. Negative campaigning through the mass media about the current service delivery is strictly prohibited. Such actions may cause your proposal to be rejected.

2.30 OWNER'S RIGHT TO NEGOTIATE WITH THE LOWEST BIDDER:

In the event *all* responsive and responsible bids are in excess of the budget, the Owner, in its sole and absolute discretion and in addition to the rights set forth above, reserves the right either to (i) supplement the budget with additional funds to permit award to the lowest responsive and responsible bid, or (ii) to negotiate with the lowest responsive and responsible bidder (after taking all deductive alternates) only for the purpose of making changes to the Project that will result in a cost to the Owner that is within the budget, as it may be amended.

2.31 **REFERENCES - \$500,000 or more:** On July 25, 2003 the Board of Commissioners directed that all construction projects with a bid of \$500,000 or more, for bidders to be responsive each must provide information on the most recent five (5) projects with similar scope of work as well as other information to determine experience and qualifications as follows:

- a. Project Name: _____
Location: _____
Owner: _____
Address: _____
City and State: _____
Contact: _____
Phone & Fax: _____
*Architect or Engineer: _____
Contact: _____
Phone & Fax: _____
Email: _____
- b. The awarded bid amount and project start date.
- c. Final cost of project and completion date.
- d. Number of change orders.
- e. Contracted project completion in days.
- f. Project completed on time. Yes ___ No ___ Days exceeded _____.
- g. List previous contracts your company performed for Chatham County by Project Title, date and awarded/final cost.
- h. Has contractor ever failed to complete a project? If so, provide explanation.
- i. Have any projects ever performed by contractor been the subject of a claim or lawsuit by or against the contractor? If yes, please identify the nature of such claim or lawsuit, the court in which the case was filed and the details of its resolution.

\$499,000 and less: Provide references from owners of at least three (3) projects of various sizes for which contractor was the prime contractor. Include government owners if possible. If the contractor has performed any work for the Chatham County Board of Commissioners within the last five (5) years, at least one (1) of the three (3) owner references must be from the appropriate party within the Chatham County Government. provide in the format as in (a) above on the attached form.

Failure to provide the above information may result in your firm's bid being rejected and ruled as non-responsive.

NOTE: FORMS FOR YOU TO FILL OUT FOR YOUR REFERENCES ARE ATTACHED TO THE BACK OF THIS BID PACKAGE.

2.32 CONSTRUCTION APPRENTICE PROGRAM HIRING:

Chatham County has established a Construction Apprentice Program (CAP) to train area residents in the building trades. Successful Contractor shall be required to make a good faith effort to utilize labor from the CAP Program on this project when feasible. A Good Faith Effort will be demonstrated by documentation of inquiry into CAP labor available and resulting hiring of CAP labor or providing reasons for Contractor not utilizing any CAP labor. Form demonstrating Good Faith Effort is enclosed as Attachment F. Contractor shall complete the form and return with their first pay request. All questions regarding CAP student hiring should be directed to Construction Program Manager, Tara Sinclair at (912) 604-9574.

2.33 SECURITY AND IMMIGRATION COMPLIANCE ACT AND SYSTEMATIC ALIEN

VERIFICATION FOR ENTITLEMENTS (SAVE): On July 1, 2008, the Georgia Security and Immigration Compliance Act (SB 529, Section 2) became effective. All contractors and subcontractors entering into a contract or performing work must sign an affidavit that he/she has used the E-Verify System. E-Verify is a no-cost federal employment verification system to insure employment eligibility. Affidavits are enclosed in this solicitation. You may download M-274 Handbook for Employers at <http://www.dol.state.ga.us/spotlight/employment/rules>. You may go to <http://www.uscis.gov>, to find the E-Verify information.

O.C.G.A. § 50-36-1, requires Georgia's counties to comply with the federal **Systematic Alien Verification for Entitlements (SAVE) Program**. SAVE is a federal program used to verify that applicants for certain "public benefits" are legally present in the United States. Contracts with the County are considered "public benefits." Therefore, the successful bidder will be required to provide the Affidavit Verifying Status for Chatham County Benefit Application prior to receiving any County contract. The affidavit is included as part of this bid package (Attachment H) but is only required of the successful bidder.

ADDITIONAL CONDITIONS

3.1 Firm Fixed Price: Contractor shall provide a firm fixed price which will be valid for acceptance within 90 days of receipt of bid

3.2. METHOD OF COMPENSATION. The compensation provided for herein shall include all claims by the CONTRACTOR for all costs incurred by the CONTRACTOR in the conduct of the Project as authorized by the approved Project Compensation Schedule and this amount shall be paid to the CONTRACTOR after receipt of the invoice and approval of the amount by the COUNTY. The COUNTY shall make payments to the CONTRACTOR within thirty (30) days from the date of receipt of the CONTRACTOR's acceptable statement on forms prepared by the CONTRACTOR and approved by the COUNTY.

Should the Project begin within any one month, the first invoice shall cover the partial period from the beginning date of the Project through the last day of the month (or on a mutually agreeable time) in which it began. The invoices shall be submitted each month until the Project is completed. Invoices shall be itemized to reflect actual expenses for each individual task; also refer to the requirements concerning changes, delays and termination of work under Sections I-8, 9, and 10 of the contract. Each invoice shall be accompanied by a summary progress report which outlines the work accomplished during the billing period and any problems that may be inhibiting the Project execution. The terms of this contract are intended to supersede all provisions of the Georgia Prompt Pay Act.

As long as the gross value of completed work is less than 50% of the total contract amount, or if the contractor is not maintaining his construction schedule to the satisfaction of the engineer, the County shall retain 10% of the gross value of the completed work as indicated by the current estimate approved by the engineer.

After the gross value of completed work becomes to or exceed 50% of the total contract amount within a time period satisfactory to the County, then the total amount to be retained may be reduced to 5% of the gross value of the completed work as indicated by the current estimate approved by the engineer, until all pay items are substantially completed.

When all work is completed and time charges have ceased, pending final acceptance and final payment the amount retained may be further reduced at the discretion of the County.

The CONTRACTOR may submit a final invoice to the County for the remaining retainage upon COUNTY'S acceptance of the Certificate of Substantial Completion. Final payment constituting the entire unpaid balance due shall be paid by the COUNTY to the CONTRACTOR when work has been fully completed and the contract fully performed, except for the responsibilities of the CONTRACTOR which survive final payment. The making of final payment shall constitute a waiver of all claims by Chatham County except those arising from unsettled liens, faulty or defective work appearing after substantial completion, failure of the work to comply with the requirements of the Contract Documents, or terms of any warranties required by the Contractor Documents or those items previously made in writing and identified by the COUNTY as unsettled at the time of final application for payment. Acceptance of

final payment shall constitute a waiver of all claims by the CONTRACTOR, except those previously made in writing and identified by the CONTRACTOR as unsettled at the time of final application for payment.

3.2.1. **FORCE ACCOUNT:** When no agreement is reached for additional work to be done at Lump Sum or Unit Prices, then such additional work shall be done based on the following Cost-Plus-Percentage basis of payment. The Georgia Department of Transportation specifications for the use of a force account will not be used.

- a. For work performed by the prime contractor/general contractor, the contractor shall be reimbursed for actual cost incurred in doing the work, and an additional payment of 15% to cover overhead and profit.
- b. For work performed by a sub-contractor, the sub-contractor shall be reimbursed for actual cost incurred in doing the work, and an additional payment of 10% to cover overhead and profit. The contractor shall be allowed an overhead and profit mark-up not to exceed 7% on the subcontractor's price. The County shall not recognize subcontractors of subcontractors.
- c. The term "Actual Cost" shall include the cost of material and labor as follows:
 - i. Material cost - Direct cost of material, sales tax, freight and equipment rental.
 - ii. Labor cost - Man hour cost listed separately by trade, payroll costs including workman's compensation, social security, pension and retirement.
- d. The term "Overhead and Profit" shall include bonds (Payment & Performance, Roof & Wall), insurance (Liability, Builders Risk), permits, supervision costs (cost of subcontractor to supervise own work, cost of contractor to supervise work of sub-contractor), proposal preparation and all administrative costs.

3.2.2. **LIQUIDATED DAMAGES:** Failure to complete the work within the duration plus any extension authorized in writing by the County Engineer shall entitle the County to deduct as "Liquidated Damages" from the monies due the Contractor the amount of **\$1,000** for each calendar day in excess of the authorized construction time.

3.3 SURETY REQUIREMENTS and Bonds: (Check where applicable)

- X A. Such bidder shall post a bid bond, certified check or money order made payable to the Chatham County Finance Department in the amount of 5% of the bid price.
- X B. Contractor(s) shall post a payment/performance bond, certified check or money order made payable to the Chatham County Finance Department in the amount of 100% of the bid price if awarded the purchase. Such bond(s) are due prior to contract execution as a guarantee that goods meet specifications and will be delivered per contract. Such bonds will also guarantee quality performance of services and timely payment of invoices to any subcontractors.
- X C. Whenever a bond is provided, it shall be executed by a surety authorized to do business in the State of Georgia and approved by Chatham County.

- X D. Bidder acknowledges Chatham County's right to require a Performance and Payment Bond of a specific kind and origin. "Performance Bond" means a bond with good and sufficient surety or surities for the faithful performance of the contract and to indemnify the governmental entity for any damages occasioned by a failure to perform the same within the prescribed time. Such bond shall be payable to, in favor of, and for the protection of the governmental entity for which the work is to be done. "Payment Bond" means a bond with good and sufficient surety or sureties payable to the governmental entity for which the work is to be done and intended for the use and protection of all subcontractors and all persons supplying labor, materials, machinery, and equipment in the prosecution of the work provided for in the public works construction contract.
- X E. Forfeit the amount of the Bid Bond if he/she fails to enter into a contract with Chatham County to do and/or furnish everything necessary to provide service and/or accomplish the work stated and/or specified in this bid proposal for the bid amount, and;
- 3.4 **Warranty Requirements:** (Check where applicable):
- a. Provisions of item 2.12 apply.
- b. Warranty required.
- X 1. Standard warranty shall be offered with bid.
2. Extended warranty shall be offered with bid. The cost of the extended warranty will be listed separately on the bid sheet.
- 3.5 **Terms of Contract:** (check where applicable):
- a. Annual Contract
- b. One-time Purchase
- X c. Other ONE TIME CONTRACT

CONVERSATIONS OR CORRESPONDENCE REGARDING THIS SOLICITATION OR REPORT BETWEEN PROSPECTIVE OFFERORS AND PERSONS OUTSIDE THE CHATHAM COUNTY PURCHASING OFFICE WILL NOT BE CONSIDERED OFFICIAL OR BINDING UNLESS OTHERWISE SPECIFICALLY AUTHORIZED WITHIN THIS DOCUMENT.

The undersigned bidder or proposer certifies that he/she has carefully read the preceding list of instructions to bidders and all other data applicable hereto and made a part of this invitation; and, further certifies that the prices shown in his/her bid/proposal are in accordance with all documents contained in this Invitation for Bids/ Proposals package, and that any exception taken thereto may disqualify his/her bid/proposal.

This is to certify that I, the undersigned bidder, have read the instructions to bidder and agree to be bound by the provisions of the same.

This _____ day of _____ 20 ____.

BY _____

SIGNATURE

TITLE

COMPANY

Phone / Fax No's.

CHECKLIST FOR SUBMITTING BID

Sign below and submit this sheet with Bid

NOTE: All of the following items must be submitted with your Bid to be considered “responsive”.

- 1. ACKNOWLEDGMENT OF ANY/ALL ADDENDUMS (Page 3 of ITB)**
- 2. ORIGINAL SURETY BOND (5% OF BID) ALONG WITH *SURETY REQUIREMENTS* SHEET FILLED OUT (page 23 of ITB)**
- 3. BID SHEET COMPLETELY FILLED OUT AND SIGNED.**
- 4. “LIST OF SUBCONTRACTORS” SHEET FILLED OUT WITH ALL SUBCONTRACTORS AND SUPPLIERS.**
- 5. “% TO MBE SUBCONTRACTORS/SUPPLIERS” (ON ATTACHMENT G) SHOWING % OF PROJECT THAT IS PROJECTED TO GO TO M/WBE SUBCONTRACTORS / SUPPLIERS MUST BE COMPLETELY FILLED OUT.**
- 6. SECTION 2.28 OF ITB (page 16) REFERENCES: Read this section and submit the correct number of “References” (based on total dollar amount of project) Note: Supply ALL the information that is requested for each Reference. NOTE: *Forms for Reference Information are attached to this Bid Package.***
- 7. COMPLETE AND SUBMIT ALL ATTACHMENTS TO THE ITB (Attachments A thru H).**
- 8. SUBMIT A COPY OF YOUR CURRENT *STATE OF GEORGIA UTILITY CONTRACTORS LICENSE.***

NAME / TITLE

COMPANY

ADDRESS

PHONE / FAX NO'S.

CHATHAM COUNTY, GEORGIA

SURETY REQUIREMENTS

A Bid Bond for five percent (5%) of the amount of the bid is required to be submitted with each bid.

A Performance Bond for one hundred percent (100%) of the bid will be required of the successful bidder.

The Bidder certifies that he/she has examined all documents contained in this bid package, and is familiar with all aspects of the proposal and understands fully all that is required of the successful bidder. The Bidder further certifies that his/her bid shall not be withdrawn for thirty (30) days from the date on which his bid is publicly opened and read.

The Bidder agrees, if awarded this bid, he/she will:

- A. Furnish, upon receipt of an authorized Chatham County Purchase Order, all items indicated thereon as specified in this bid proposal for the bid amount, or;
- B. Enter a contract with Chatham County to do and/or furnish everything necessary to provide the service and/or accomplish the work as stated and/or specified in this bid proposal for the bid amount, and;
- C. Furnish, if required, a Performance Bond, and acknowledges Chatham County's right to require a Performance Bond of a specific kind and origin, and;
- D. Forfeit the amount of the Bid Bond as liquidated damages if he/she fails to enter a contract with Chatham County as stated in (B) above, within fifteen (15) days of the date on which he/she is awarded the bid, and/or;
- E. Forfeit the amount of the Performance Bond as liquidated damages if he/she fails to execute and fulfill the terms of the contract entered. The amount of forfeiture shall be:
 1. The difference between his/her bid and the next lowest, responsible bid that has not expired or been withdrawn, or;
 2. The difference between his/her bid and the amount of the lowest, responsible bid received as a result of rebidding, including all costs related to rebidding.

COMPANY

DATE

SIGNATURE

TITLE

TELEPHONE NUMBER

PROPOSAL

SPECIFICATIONS FOR:

LAROCHE AVENUE CULVERT

BID NO. 12-0014-4

The project is located at Laroche Avenue between Neva Avenue and Lansing Avenue in unincorporated Chatham County.

The work will consist of furnishing all materials, labor and equipment for:

replacing the brick arch culvert under Laroche Avenue with a 12' x 6' box culvert. All associated work for the culvert replacement is included on the construction drawings. The associated work includes the relocation of a water and sewer main. These relocations shall be performed with minimal interruption of services.

A location map, construction plans, technical specifications and special provisions for the project is provided elsewhere in these contract documents.

Note: This shall be a unit price contract. Quantities are approximate and payment shall be for actual in-place work measurements.

COMMENCEMENT AND COMPLETION:

**WORK SHALL BEGIN WITHIN 10 DAYS AFTER RECEIPT OF "NOTICE TO PROCEED".
ALL WORK SHALL BE COMPLETED WITHIN 150 CALENDAR DAYS AFTER THE
TEN DAY PERIOD.**

Bid Sheet
Laroche Avenue Culvert

Item	Description	Quantity	Unit	Unit Price	Item Total
General					
1.	General Conditions / Mobilization (shall not exceed 3% of the total bid amount)	1	LS		
Demolition					
2.	Demolition/Removal of All Features Shown on Plans Except Timber Piles	1	LS		
3.	Remove & Dispose of Timber Piles	1,000	VLF		
Erosion, Sedimentation, and Pollution Control					
4.	Construction Exit (Installation and Maintenance)	2	EA		
5.	Type A Silt Fence (Installation and Maintenance)	60	LF		
6.	Type C Silt Fence (Installation and Maintenance)	110	LF		
7.	Inlet Sediment Trap (Installation and Maintenance)	1	EA		
8.	Turbidity Curtain (Installation and Maintenance)	140	LF		
9.	Temporary Downdrain (Installation and Maintenance)	1	EA		
Site Work - Paving, Grading, and Drainage					
10.	Dewatering	1	LS		
11.	GDOT Type 1 Rip Rap	120	CY		
12.	GDOT Type 3 Rip Rap	74	CY		
13.	Furnish & Place Filter Fabric (for Rip Rap)	267	SY		
14.	Remove Unsuitable Material 2' (Pipe/Wingwall)	20	CY		
15.	Excavated Material Hauled Offsite	337	CY		
16.	Select Fill (No Particles over 2" dia) (95% Compaction MP)	885	CY		
17.	Backfill & Compact for Box Culvert	323	CY		
18.	#57 Stone - Scour	45	CY		
19.	2" 12.5mm HMA Superpave Wearing Course	505	SY		
20.	2" 19mm HMA Superpave Binder Course	505	SY		
21.	8" Compacted GABC	505	SY		
22.	Fine Grading - Preparation of Subgrade	505	SY		
23.	Hydro Seeding, Temporary and Permanent Mix	350	SY		
24.	Sanitary Sewer Manhole	1	EA		
25.	8" DI Sewer Main	62	LF		
26.	8" DI Water Main MJ	65	LF		
27.	8" 45 Deg Bend	6	EA		
28.	18" Dia. Class V RCP Drain Pipe	61	LF		
29.	6" Concrete Pad for Property on North Side of Canal	1,250	SF		
Concrete Box Culvert & Apron					
30.	12' x 6' Concrete Culvert & Concrete Headwalls	78	CY		
31.	Concrete Apron	30	CY		
32.	Steel L4x3x1/2 (Pile Connections) & Bolts	1	LS		
33.	H - Piles	2,040	VLF		
34.	PDA Testing	2	EA		
Concrete Wingwalls					
35.	CIP Concrete Wingwalls (3 Total)	1	LS		
36.	Concrete Sheet Piles (1 Total)	2,450	SF		
37.	Grouting of Keys	1	LS		
38.	Reinforced Concrete Sheet Pile Wall Cap	5	CY		
39.	Concrete Abutment Closure Pour	1	EA		
40.	4-inch Dia. PVC Weephole	8	EA		
41.	SS (Square Shaft) Helical Anchors + Accessories	7	EA		
42.	PDA Testing (Anchors)	2	EA		
Pavement Markings & Signage					
43.	Striping	500	LF		
44.	Signage	9	EA		
45.	Thermoplastic	24	SF		
Misc. Hardware					
46.	Handrails	70	LF		
47.	Guardrails	150	LF		
Miscellaneous					
48.	Field Condition Allowance				\$50,000.00

(Signed)

(Date)

Total Estimated Cost

LIST OF SUBCONTRACTORS

I do _____, do not _____, propose to subcontract some of the work on this project. I propose to subcontract work to the following subcontractors:

[illegible]

SIGNED: _____
CONTRACTOR

SECTION 01600

SPECIAL CONDITIONS

PART 1 – PROJECT DESCRIPTION

1.01 LOCATION AND DESCRIPTION OF WORK

- A. The project is located at Laroche Avenue between Neva Avenue and Lansing Avenue in unincorporated Chatham County.
- B. The work consists of replacing the brick arch culvert under Laroche Avenue with a 12'x6' box culvert.
- C. All associated work for the culvert replacement is included on the construction drawings. The associated work includes the relocation of a water and sewer main. These relocations shall be performed with minimal interruption of services.
- D. Laroche Avenue shall be closed to public traffic from Neva Avenue to the parking area of the restaurant while construction is in progress. The existing right of way within this boundary shall be used as staging and storage areas. At the completion of the project the Contractor shall restore all areas to equal or better than its preconstruction condition.

PART 2 – CONTRACT DOCUMENTS

2.01 TECHNICAL SPECIFICATIONS

- | | | |
|----|-------|---|
| A. | 02220 | Site Demolition |
| B. | 02231 | Clearing and Grubbing |
| C. | 02300 | Earthwork |
| D. | 02373 | Geotextile |
| E. | 02456 | Precast/Prestressed Concrete Sheet Piling |
| F. | 02510 | Water Distribution |
| G. | 02531 | Sanitary Sewers |
| H. | 02630 | Storm Drainage |
| I. | 02704 | Graded Aggregate Base Course (GABC) |
| J. | 02745 | Hot Mix Asphalt Concrete Pavement |
| K. | 02763 | Pavement Markings |

2.02 DRAWINGS

- | | | |
|----|-------|--|
| A. | G-001 | Cover Sheet |
| B. | G-002 | General Notes and Abbreviations Sheet 1 of 2 |
| C. | G-003 | General Notes and Abbreviations Sheet 2 of 2 |
| D. | G-004 | ESPC General Notes Sheet 1 of 3 |
| E. | G-005 | ESPC General Notes Sheet 2 of 3 |
| F. | G-006 | ESPC General Notes Sheet 3 of 3 |
| G. | G-101 | Project Site Plan |
| H. | G-102 | Traffic Control Plan Sheet 1 of 2 |
| I. | G-103 | Traffic Control Plan Sheet 2 of 2 |

J.	B-001	Boring Logs
K.	V-101	Existing Site Plan
L.	C-101	Initial ESPC Plan
M.	C-102	Intermediate & Final ESPC Plan
N.	C-103	Demolition Plan
O.	C-104	Storm Drainage & Utility Plan
P.	C-105	Paving & Grading Plan
Q.	C-106	Signage & Striping Plan
R.	C-301	Typical Section & Elevations
S.	C-302	Storm Drainage & Utility Profiles
T.	C-501	ESPC Details Sheet 1 of 4
U.	C-502	ESPC Details Sheet 2 of 4
V.	C-503	ESPC Details Sheet 3 of 4
W.	C-504	ESPC Details Sheet 4 of 4
X.	C-505	Miscellaneous Civil Details
Y.	C-601	Working Point Schedules
Z.	S-101	Culvert & Pile Plan
AA.	S-301	Box Culvert Sections
BB.	S-302	West Headwall & Wingwall Elevations & Sections
CC.	S-303	East Headwall & Wingwall Elevations & Sections
DD.	S-304	Concrete Apron Sections
EE.	S-501	Concrete Sheet Pile Details Sheet 1 of 2
FF.	S-502	Concrete Sheet Pile Details Sheet 2 of 2
GG.	S-503	Miscellaneous Structural Details
HH.	S-601	Pile Schedule

PART 3 – PRE-CONSTRUCTION AND POST-CONSTRUCTION INSPECTIONS

3.01 PRE-CONSTRUCTION INSPECTION

- A. A pre-construction conditions video (standard DVD format) is required and must be submitted to Chatham County Department of Engineering for approval prior to start of any land disturbing work. Special emphasis shall be given to record pre-disturbance condition of roadway pavements, curbing, sidewalks, driveways, buildings, utilities and other improvements located within or within 100 feet of the project limits. This is in addition to other inspections and surveys required of the Contractor or performed by the County. The video shall be prepared by a professional photographer having experience in similar work and approved by the County. A voice narrative shall identify location and features of the preconstruction video. A typewritten version of the voice narrative shall be provided upon request.
- B. The Contractor shall provide a pre-construction video of the sanitary sewer main showing existing conditions. The limits of the video shall extend to the first sanitary sewer manhole outside the project limits in each direction.
- C. A pressure test shall be performed on the existing water system to determine conditions prior to construction.

3.02 POST-CONSTRUCTION INSPECTION

- A. The Contractor shall provide and pay all costs of a video inspection record of the completed pipe systems produced by a qualified sewer inspection company or agency (Chatham County or City of Savannah inspection crews are acceptable, however the Contractor shall remain responsible for paying all costs). The video inspection record shall be provided on standard DVD and compatible with County viewing software. All deficiencies identified by the inspection shall be corrected by the Contractor prior to acceptance of the work as substantially complete.

PART 4 – STAKING

4.01 CONSTRUCTION STAKING AND CONTROL OF WORK

- A. The County shall engage a surveyor registered by the State of Georgia to provide initial construction stakeout and demarcation project limits and property lines. Ongoing control of the project work shall be the responsibility of the Contractor. The cost for resurvey work to reestablish initial project controls shall be paid for by the Contractor. The Contractor shall provide access and schedule all work in order to accommodate the survey work by the County's surveyor.

PART 5 - DOCUMENTATION

5.01 DOCUMENTATION TO BE PROVIDED WITH REQUESTS FOR PAYMENT

- A. In addition to the documentation described elsewhere in the Contract Documents, the Contractor shall submit with each request for payment the following:
 - 1. Inspection reports of the sediment and erosion control facilities as described in the General Permit No. GAR100002. A copy of the Georgia Soil and Water Conservation Commission certification card(s) of the person(s) completing the reports shall also be submitted. Missing or incomplete documentation of inspection reports may be cause for delay/denial of payment.
 - 2. Copies of material delivery tickets. The Contractor shall be responsible for collecting these documents at the time of delivery. The delivery tickets shall not relieve the Contractor of his responsibility to ensure the materials are in accordance with the contract documents. Missing or incomplete documentation of delivered materials may be cause for delay/denial of payment.
 - 3. Prior to submitting a request for payment, the Contractor shall review the extent of work completed with the County's representative for accuracy and completeness.

PART 6 – EROSION AND SEDIMENTATION CONTROL

6.01 DUTIES

- A. The Contractor will be responsible for installation, maintenance and repair of the sedimentation and erosion control facilities and for any modifications or adjustments necessary for the project to remain in compliance with the Georgia Erosion and Sedimentation Act during performance of the work. The Contractor will have on site at all times of construction activity a Georgia Soil and Water Conservation Commission Level 1A certified person.
- B. The contractor shall perform sediment and erosion control inspection and reporting requirements, recording daily precipitation amounts, and other duties as described in the contract documents. Inspection reports shall be provided on forms provided by the County or as approved by the County. Signed copies of the Contractor's reports shall be submitted to the County with each Request for Payment. Water quality testing and reporting will be provided by the County.
- C. The total contract amount will be reduced by an amount as specified in the fines section below for each occurrence of failure to conform to the sediment and erosion control requirements of the contract. For the purpose of this paragraph an occurrence shall be defined as each 24-hour period with consecutive 24-hour periods being measured as separate occurrences. This fee shall be in addition to any penalties or assessments made against the Contractor for non-compliance of the Georgia Water Quality Control Act.

PART 7 - FINES AND LIQUIDATED DAMAGES

7.01 FINE

- A. A \$200 per day fee shall be assessed against the Contractor and withheld from the Lump Sum Contract Price for each and every day that the erosion and sedimentation control plan is not in proper operation. This fee shall be in addition to any penalties or assessments made against the Contractor for non-compliance of the Georgia Water Quality Control Act.

7.02 LIQUIDATED DAMAGES

- A. Liquidated Damages shall be assessed at \$1000 per calendar day for work not completed within the Contract period. The full amount of liquidated damages will be deducted from the final payment to the Contractor.

PART 8 - ALLOWANCE

8.01 FIELD CONDITION ALLOWANCE

- A. The Field Condition Allowance shown on the bid sheet shall belong to Chatham County. Bidders shall not use this Allowance to assume any Contractor costs known or unknown at the bidding. Chatham County must approve use of the Allowance. Bidders shall include this Field Condition Allowance within their base bid. Any unused allowance shall revert to Chatham County.

PART 9 - SPECIAL REQUIREMENTS OF CONSTRUCTION

9.01 REQUIREMENTS

- A. Work hours shall be limited to 7:00 am to 7:00 pm Monday through Friday and shall exclude holidays unless otherwise approved by Chatham County.
- B. All work is to be performed within the existing right of ways and easements. **The Contractor shall obtain an Encroachment Permit from the Department of Public Works prior to any work within road rights of way.** Permission to use private property outside of these areas shall be obtained by the Contractor in writing. Copies of such agreements shall be provided to the Chatham County Engineering Department.
- C. The Contractor shall provide approved means and methods upstream and downstream of the excavation to control water as needed in any open excavations as required for construction. The Contractor's means and methods shall apply to a normal tide cycle and not impede natural drainage through the construction site.
- D. Watering past the date of substantial completion of the work shall be provided on seeded areas to achieve full coverage to match existing conditions and as accepted by Chatham County.
- E. There are existing water and sewer mains to be relocated within the project limits. These mains will be relocated without interruption to services unless otherwise permitted by Chatham County.
- F. The Contractor shall provide traffic control during the construction of the project. No work shall commence until a detailed traffic control plan is reviewed and approved by Chatham County. Laroche Avenue shall be closed to traffic. The Contractor shall notify all emergency services of any road closure as well as the school system for bus routes. All signage regarding closure shall be posted no less than one week prior to any closures.
- G. The Contractor shall make every effort to minimize the length of time required for the Laroche Avenue road closure. A detailed time schedule for the road closure and re-opening shall be provided to and approved by Chatham County prior to beginning demolition or construction.
- H. Unsuitable material shall be removed and replaced with suitable material meeting the requirements of the specifications. Measurement of unsuitable material shall exclude excavation of all materials within the limits of excavation shown on the drawings. Measurements of unsuitable material shall be made by cross section method as approved by Chatham County. Measurement by truck count will not be allowed unless otherwise stated.
- I. Contractor to remove and replace 6" concrete pad on the adjacent lot east of Laroche Avenue north of the canal.

PART 10 - GEOTECHNICAL INVESTIGATION

10.01 DATA

- A. A boring log provided by Terracon Consultants, Inc. is included in the plans on sheet B-001 with locations shown on V-101. This data is offered for information only with no responsibility by the Owner or Engineer for variation in subsoil quality or conditions at the boring locations or at locations other than those shown or at times when the borings were made.

SECTION 02220

SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

Work under this section includes requirements for removal of reinforced concrete, asphalt pavement, a masonry drainage structure, tabby wingwalls, guardrails, utility poles and associated overhead lines, removal of suspended utility pipes, and other miscellaneous and incidental items and removals as they relate to the work for this project. The Contractor shall furnish all labor, equipment and utilities to complete the work as indicated on the project drawings and as specified herein.

1.2 GENERAL REQUIREMENTS

Do not begin demolition until authorization is received from Chatham County. The work includes demolition of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Chatham County property and the project site daily, unless otherwise directed. Materials that cannot be removed daily shall be stored in areas approved by Chatham County.

1.2.1 Site Examination

The Contractor shall be responsible for visiting and examining the project site to assess the extent of demolition, removal and general work to be done.

1.3 SUBMITTALS

The following shall be submitted in accordance with this section.

1.3.1 Statements

A. Demolition Plan

Submit proposed demolition and removal procedures for approval before work is started. The Demolition Plan shall include coordination with other work in progress, a disconnection schedule and procedure for the utility systems in service, and a detailed description of methods and equipment to be used for each operation and the sequence of operations. Include statements affirming a Contractor inspection of the existing structure and its' components and its' suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. Particular focus should be provided on the control of water and timing of the work.

1.4 REGULATORY AND SAFETY REQUIREMENTS

Comply with federal, state, and local hauling and disposal regulations.

1.5 DUST AND DEBRIS CONTROL

Prevent the spread of dust and debris off-site and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.6 PROTECTION

1.6.1 Traffic Control Signs

Where pedestrian and driver safety is endangered in the area of removal work, mark all hazards with signs, traffic barricades and flagmen as necessary to warn of construction work in progress. Anchor barricades in a manner to prevent displacement by wind. The Contractor shall be responsible for any damage caused by his operations. Notify Chatham County prior to beginning such work. Additionally, follow work delineation as shown on the Drawings.

1.6.2 Existing Conditions

Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record the existing conditions per Section 01600.

1.6.3 Items to Remain in Place

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of Chatham County. Repair or replace damaged items as approved by Chatham County. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload pavements to remain. Repairs, reinforcement, or structural replacement require approval by Chatham County prior to performing such work.

1.6.4 Existing Construction

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.

1.6.5 Trees

All trees that are within the embankments, the work area and the new access roadway shall be removed including stumps. All other trees shall be protected. Protect trees that fall outside of areas described above which may be potentially impacted by the work by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees.

1.6.6 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition operations.

1.6.7 Protection of Personnel

Before, during and after the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.

1.6.8 Work

Assume responsibility for all demolition work and protection of demolition work. Provide additional grading, as necessary, to prevent damage to demolition work by water (surface runoff) at no additional cost to Chatham County.

1.6.9 Debris in Canal

The Contractor shall remove all rubbish, and debris that is within the limits of the project site, which includes the existing embankments and canal. This shall include all broken concrete, trash, tree stumps, tree branches and other vegetation.

1.7 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.8 ENVIRONMENTAL PROTECTION

Comply with all local, state and federal environmental protection requirements.

1.9 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Choice of equipment to perform specified operations is the responsibility of the Contractor.

B. When performing work after daylight hours:

- (1) Obtain written approval from Chatham County.
- (2) Provide and maintain sufficient artificial lighting to permit proper demolition work, observation, and inspection.

2.2 FILL MATERIAL

Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill voids, depressions or excavations resulting from demolition of structures. See Section 02300 "Earthwork."

PART 3 - EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

Remove existing structures indicated to be removed.

3.1.2 Utilities and Related Equipment

3.1.2.1 Disconnecting Existing Utilities

Remove existing utilities, as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by Chatham County. When utility lines are encountered that are not indicated on the drawings,

Chatham County shall be notified prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of Chatham County.

3.1.3 Paving

Remove asphaltic concrete paving as indicated. Provide and maintain neat sawcuts at limits of pavement removal as indicated.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition work in areas occupied by structures to be demolished until all demolition in the area has been completed and debris removed. Holes and other hazardous openings shall be filled.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

All materials and equipment removed and not reused, shall become the property of the Contractor and shall be removed from Chatham County property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by Chatham County of the Contractor's Demolition Plan, and authorization by Chatham County to begin demolition. Chatham County will not be responsible for the condition or loss of, or damage to, such property after contract award. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment listed and indicated to be reused or relocated to prevent damage, and reinstall as the work progresses.

3.4 CLEANUP

Debris and rubbish shall be removed from the project site. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Disposal General

Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations in accordance with all applicable federal, state and local regulations. Removed materials shall not be stored on the project site.

3.5.2 Burning on County Property

Burning of materials on Chatham County property will not be permitted.

3.5.3 Removal from Owner Property

Transport waste materials from property for legal disposal.

End of Section 02220

SECTION 02231

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

Work under this section includes requirements for clearing and grubbing the project area as indicated on the drawings. The work of this section shall include, but not be limited to clearing and disposing of all trees, stumps, shrubbery growth, roots and other vegetation within the project limits. The Contractor shall furnish all labor, equipment and utilities to complete the work as indicated on the project drawings and as specified herein.

1.2 SITE CONDITIONS

The Contractor shall be responsible for visiting and examining the project site to assess the extent of clearing and grubbing work to be done.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 LIMITS OF SITE CLEARING AND GRUBBING

The Contractor shall perform site clearing to the limits of the work area shown on the drawings.

3.2 PROTECTION

3.2.1 Roads and Walkways

Keep roads and walkways free of dirt and debris at all times.

3.2.2 Trees, Shrubs, and Existing Facilities

Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.2.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify Chatham County immediately of damage to or an encounter with an unknown existing utility line. The Contractor shall be responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, the Contractor shall notify Chatham County in ample time to minimize interruption of the service.

3.3 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obstruct, encroach upon, or otherwise obstruct

the work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface.

3.4 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.5 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.6 DISPOSAL OF MATERIALS

3.6.1 Saleable Timber

All timber on the project site noted for clearing and grubbing shall become the property of the Contractor, and shall be removed and disposed of off of the project site.

3.6.2 Non-saleable Materials

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be disposed of off of the project site at the Contractor's responsibility. The use of burning at the project site for the disposal of refuse and debris will not be permitted.

End of Section 02231

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

The work under this section consists, in general, of furnishing all labor, materials, tools, equipment, and incidentals for providing for the excavation, backfilling, and compaction of all structures, utilities, pavements, and the canal embankments indicated on the project drawings and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

**AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)**

AASHTO T 180 (2001) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb)
Rammer and a 457-mm (18-in) Drop

AASHTO T 224 (2001) Correction for Coarse Particles in the Soil Compaction
Test

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C600 (1999) Installation of Ductile-Iron Water Mains and Their
Appurtenances

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136 (2006) Standard Test Method for Sieve Analysis of Fine and Coarse
Aggregates

ASTM D 1140 (2000) Amount of Material in Soils Finer than the No. 200 (75-
micrometer) Sieve

ASTM D 1556 (2000) Density and Unit Weight of Soil in Place by the Sand-Cone
Method

ASTM D 1557 (2002e1) Laboratory Compaction Characteristics of Soil Using Modified
Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))

ASTM D 2487 (2000) Soils for Engineering Purposes (Unified Soil Classification
System)

ASTM D 2922 (2004) Density of Soil and Soil-Aggregate in Place by Nuclear Methods
(Shallow Depth)

ASTM D 3017 (2004) Water Content of Soil and Rock in Place by Nuclear Methods
(Shallow Depth)

ASTM D 422 (1963; R 2002) Particle-Size Analysis of Soils

- ASTM D 4318 (2000) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D 698 (2000ae1) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu.m.))

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

- EPA 600/4-79/020 (1983) Methods for Chemical Analysis of Water and Wastes
- EPA SW-846.3-3a (1999) Test Methods for Evaluating Solid Waste: Physical/Chemical Methods; Third Edition; Final Update III-A

GEORGIA DEPARTMENT OF TRANSPORTATION (GDOT)

- GDOT (2001) State of Georgia - Standard Specifications for Construction of Transportation Systems

1.3 MEASUREMENT

1.3.1 Excavation & Backfilling

All excavation and backfilling of the embankments shall be done on a lump sum basis.

1.3.2 Select Granular Material

Select granular material shall be measured in place as the actual cubic yards replacing wet or unstable material in trench bottoms and to bring embankments to the indicated grades. The unit price shall include furnishing and placing the granular material, excavation and disposal of unsatisfactory material, and additional requirements for sheeting and bracing, pumping, bailing, cleaning, and other incidentals necessary to complete the work.

1.4 DEFINITIONS

1.4.1 Satisfactory or Suitable Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, SW, SP, and SM. The plasticity index shall not be greater than 10 percent when tested in accordance with ASTM D 4318, and not more than 25 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D 1140. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for pavements which shall be comprised of stones less than 3 inches in any dimension.

1.4.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, backfills from previous construction, and material classified as satisfactory which contains root and other organic matter or frozen material. Chatham County shall be notified of any contaminated materials.

1.4.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.4.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density. Since ASTM D 1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve shall be expressed as a percentage of the maximum density in accordance with AASHTO T 180 Method D and corrected with AASHTO T 224. To maintain the same percentage of coarse material, the "remove and replace" procedure as described in the NOTE 8 in Paragraph 7.2 of AASHTO T 180 shall be used.

1.4.5 Topsoil

Material suitable for topsoils obtained from offsite and onsite areas, or excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.4.6 Hard/Unyielding Materials

Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 48 inches in any dimension. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.4.7 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.4.8 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, pavement or appurtenant structure.

1.4.9 Select Granular Material

1.4.9.1 General Requirements

Select granular material shall consist of materials classified as GW, GP, SW, SP by ASTM D 2487 where indicated. The liquid limit of such material shall not exceed 35 percent when tested in accordance with ASTM D 4318. The plasticity index shall not be greater than 5 percent when tested in accordance with ASTM D 4318, and not more than 10 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D 1140. Coefficient of permeability shall be a minimum of 0.002 feet per minute when tested in accordance with ASTM 2434.

1.4.10 Expansive Soils

Expansive soils are defined as soils that have a plasticity index equal to or greater than 50 when tested in accordance with ASTM 4318.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01300, "Submittals."

A. Preconstruction Submittals

1. Shoring
2. Dewatering Work Plan

Submit 15 days prior to starting work.

B. Product Data

1. Proposed source of borrow material.

C. Test Reports

1. Borrow Site Testing

Within 24 hours of conclusion of physical tests, 3 copies of test results, including calibration curves and results of calibration tests.

1.6 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings and in Appendix A. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations. The Contractor is responsible for making any additional subsurface investigations as necessary to perform the specified work.

1.7 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.8 BLASTING

Blasting will not be permitted.

1.9 CRITERIA FOR BIDDING

Base bids on the following criteria:

- A. Surface elevations are as indicated.
- B. Pipes or other artificial obstructions, except those indicated, will not be encountered.
- C. Ground water elevations indicated by the boring log were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
- D. Material character is indicated by the boring logs.

E. Hard materials and rock will not be encountered.

1.10 DEWATERING WORK PLAN

Submit procedures for accomplishing dewatering work.

1.11 SHORING AND SHEET PILE PLAN

See Paragraph 3.3 for requirements.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

Offsite soils brought in for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall contain less than 100 parts per million (ppm) of total petroleum hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCPL test. TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA SW-846.3-3a Method 5030/8020. TCLP shall be performed in accordance with EPA SW-846.3-3a Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by Chatham County.

2.2 MATERIAL FOR RIP RAP

Provide filter fabric conforming to GDOT SHS, Section 881.2.05 (plastic woven) and rip rap conforming to GDOT SHS, Section 603 and 805. Rip rap material shall be Type 1 or Type 3 as indicated.

2.2.1 Rock

Rock fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 700 pounds and that no more than 20 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50. The inclusion of more than trace (2 percent or less) quantities of dirt, sand, clay, and rock fines will not be permitted.

2.3 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Red:	Electric
Yellow:	Gas, Oil; Dangerous Materials; Compressed Air
Orange:	Telephone and Other Communications

Blue: Water Systems
Green: Sewer Systems

2.3.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.3.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.4 DETECTION WIRE FOR NON-METALLIC PIPING

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

2.5 GEOTEXTILE FABRIC

Provide Mirafi Geolon® HP 570 woven geotextile fabric or approved equal in areas indicated on the drawings.

PART 3 - EXECUTION

3.1 STRIPPING OF TOPSOIL

Where excavation is indicated or directed, topsoil shall be stripped to a depth of 4 inches and stockpiled. Topsoil shall be spread on areas disturbed by site construction. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Topsoil shall be spread on all areas to be sodded or seeded. Any surplus topsoil from excavations and grading shall be removed from the site.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered below Top of Subgrade within the limits of the work shall be excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of by the Contractor. Unsatisfactory excavated material shall be removed from the project site and disposed of by the Contractor. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be provided by the Contractor from offsite sources.

3.2.1 Channel Changes

Excavation of channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete is to be placed in and excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete is to be placed.

3.2.3 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

3.2.4 Dewatering

Groundwater or surface water flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 12 inches below the working level. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system.

3.2.5 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 4 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 3 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely

affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside width. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to Chatham County.

3.2.5.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.2.5.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 6 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.2.5.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to Chatham County.

3.2.5.4 Excavation for Appurtenances

Excavation for wingwalls, manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure parapets as shown. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete is to be placed.

3.2.6 Underground Utilities

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Perform work adjacent to utilities as indicated in accordance with procedures outlined by the utility company. Excavation made with power-driven equipment is not permitted within two feet of known utility or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the affected Utility. Report damage to utility lines or subsurface construction immediately to Chatham County.

3.2.7 Structural Excavation

Ensure that footing subgrades have been inspected and approved prior to concrete placement. Backfill and compact over excavations and changes in grade to 95 percent of ASTM D 698 maximum density.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas from approved private sources. No borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION

The Contractor shall notify Chatham County sufficiently in advance of the opening of any excavation to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. The Contractor shall ensure that excavation of any area or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 SHORING

3.5.1 General Requirements

The Contractor shall submit a Shoring and Sheet piling Plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a Registered Professional Engineer in the State of Georgia, describing the methods for shoring and sheet piling of excavations. Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheet piling shall be removed as excavations are backfilled, in a manner to prevent caving.

3.5.2 Geotechnical Engineer

The Contractor is required to hire a registered Professional Geotechnical Engineer in the State of Georgia to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer shall be responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer shall update the excavation, sheet piling and dewatering plans as construction progresses to reflect changing conditions and shall submit an updated plan if necessary. A written report shall be submitted, at least monthly, informing Chatham County of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Geotechnical Engineer shall be available to meet with Chatham County at any time throughout the contract duration.

3.6 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall haul satisfactory material excavated in one grading area to another grading area. Stockpiles of satisfactory and unsatisfactory and wasted materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately

stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources.

3.7 GROUND SURFACE PREPARATION

3.7.1 General Requirements

Unsatisfactory material at surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by Chatham County. Where satisfactory material is present, the surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material.

3.8 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

3.9 SUBGRADE PREPARATION

3.9.1 General Requirements

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by Chatham County. Where the in situ material passes proofrolling (stable) and is satisfactory, the surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

3.9.2 Proof Rolling

Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. Proof roll the subgrade with six passes of a dump truck fully loaded with soil transferring a load in excess of 20 tons. Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2 1/2 to 3 1/2 mph. Notify Chatham County a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Chatham County Representative. Rutting or pumping of material shall constitute failure of subgrade. At the Contractor's expense, additional proof rolling may be requested by the Chatham County Representative on any area that is deemed questionable.

- A. In areas where the in situ material is satisfactory and passes proof roll (stable), the Contractor shall compact the top 12 inches of subgrade per Paragraph 3.6.4 "Compaction."
- B. In areas where the in situ material is satisfactory but fails proof roll (unstable), the Contractor shall dry and compact the material to a depth necessary to achieve stability in

the top 12 inches of subgrade. Excavation, stockpiling, drying and compaction of satisfactory material shall be performed at the Contractor's expense. See Paragraph 3.6.4 "Compaction" for compaction requirements.

- C. In areas where the in situ material is unsatisfactory and fails proof roll (unstable), the Contractor shall undercut the unsatisfactory material to a depth of 18 inches below Top of Subgrade and replaced with select granular material. The backfill material shall be placed in lifts not to exceed 8 inches and rolled in with a static wheel roller, unless directed otherwise by the Chatham County Representative. See Paragraph 3.6.4 "Compaction" for compaction requirements.

3.9.3 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. The elevation of the finished subgrade shall not vary more than 0.05 foot from the established grade and cross section.

3.9.4 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. All material used as backfill shall be placed at optimum moisture content or within 2 percent below optimum moisture content. At a minimum, the top 12 inches of subgrade shall be compacted to at least 95 percent of laboratory maximum density per ASTM D1557.

3.9.5 Frozen Material

Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph TESTING.

3.10 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be removed from Georgia Ports Authority property. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas located on the Garden City Terminal as directed. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.11 BACKFILLING AND COMPACTION

3.11.1 Backfilling with Select Granular Material for Pavement

Select Granular Material should be placed over a stable or stabilized subgrade. Select Granular fills should be placed in thin (8 to 10 inch loose) lifts and compacted to specified density. Fill brought to the site should be within three percent (wet or dry) of the optimum moisture content. Some manipulation of the moisture content (such as wetting or drying) will be required during the filling operation to obtain the required degree of compaction. The manipulation of the moisture content is highly dependent on weather conditions and site drainage conditions. The Contractor should be prepared to both dry and wet fill materials to obtain the specified compaction during grading.

3.11.2 Backfill Adjacent to Structures

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph SUBGRADE PREPARATION. Compaction requirements for backfill materials shall also conform to the applicable portions of this paragraph and paragraphs SUBGRADE PREPARATION and EMBANKMENTS, and Section 02630 "Storm Drainage"

3.11.3 Compaction

Select Granular Material placed above the Top of Subgrade shall be compacted to at least 98% laboratory maximum density per ASTM D1557. Compaction of select granular material for pavement shall be accomplished by heavy-duty vibratory roller or other approved equipment.

3.11.4 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall only be backfilled to the spring line of the pipe until all specified tests are performed.

3.11.4.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.11.4.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.11.4.3 Bedding and Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Plastic piping shall have bedding to spring line of pipe. Provide coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

3.11.4.4 Final Backfill

The remainder of the trench, except for special materials for roadways, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

- A. Roadways: Backfill shall be placed up to the required elevation as specified. Water flooding or jetting methods of compaction will not be permitted.

3.11.5 Backfill for Appurtenances

After the wingwall has been constructed, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on the sides of the structure to prevent eccentric loading and excessive stress.

3.12 SPECIAL REQUIREMENTS

Special Requirements for both excavation and backfill are as follows:

3.12.1 Rip Rap Construction

Construct rip rap on filter fabric in accordance with GDOT SHS, Section 603 in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.12.1.1 Filter Fabric Placement

Spread filter fabric shall be placed in accordance with GDOT SHS, Section 881.2.05 and as indicated on the project plans. Compaction of bedding is not required. Finish bedding to present even surface free from mounds and windrows.

3.12.1.2 Stone Placement

Place rock for rip rap on prepared bedding described in Paragraph 3.12.1.1 to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.12.2 Water Lines

Trenches shall be of a depth to provide a minimum cover of 3 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.13 EMBANKMENTS

3.13.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for

cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.14 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades re-established to the required elevations and slopes.

3.14.1 Subgrade & Embankments

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, or pavement be placed on a muddy, spongy, or frozen subgrade.

3.14.2 Grading Around Structures

All areas shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.15 PLACING TOPSOIL

On areas to receive topsoil, the compacted Subgrade soil shall be scarified to a 2 inch depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 3 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

3.16 TESTING

Testing shall be performed by Chatham County and shall include the following:

3.16.1 Fill and Backfill Material Gradation

One test per 500 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422 or GDOT Section 812.

3.16.2 In-Place Densities

- A. One test per 500 square yards, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

- B. One test per 300 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

3.16.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

- A. Two check tests per day.

3.16.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by Chatham County.

3.16.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 300 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.16.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.16.7 Displacement of Sewers

After other required tests have been performed and the trench backfill compacted to the finished grade surface, the pipe shall be inspected to determine whether significant displacement has occurred. Pipes with sizes below 36 inches shall be examined and inspected as established in Section 01600. If the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to Chatham County.

3.15 DISPOSITION OF SURPLUS MATERIAL

Surplus material or other soil material not required or suitable for filling or backfilling, concrete, rubble and brush, refuse, stumps, roots, and timber shall be removed from Chatham County property and disposed of by the Contractor.

End of Section 02300

SECTION 02373

GEOTEXTILE

PART 1 - GENERAL

1.1 SUMMARY

The work for this section consists, in general, of furnishing all labor, materials, tools, equipment and utilities to install geotextile as a part of a new shoreline protection system as indicated on the project drawings, and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4354	(1999) Sampling of Geosynthetics for Testing
ASTM D 4759	(2002) Determining the Specification Conformance of Geosynthetics
ASTM D 4873	(2002) Identification, Storage, and Handling of Geosynthetic Rolls and Samples

1.3 MEASUREMENT

Measurement shall be made of the as-built surface area in square yards covered by geotextile. Allowance will be made for geotextile in anchor and/or drainage trenches but no allowance will be made for waste, overlaps, damaged materials, repairs, or materials used for the convenience of the Contractor.

1.4 PAYMENT

Geotextile installed and accepted will be paid for at the respective contract unit price in the bidding schedule. This unit price shall include the cost of materials, equipment, installation, testing, and other costs associated with placement of the geotextile.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01300, "Submittals."

1.5.1 Product Data

A. Manufacturer's Product Data for Geotextile

1.5.2 Certificates

A. Geotextile

A minimum of 7 days prior to scheduled use, manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could

damage other geosynthetic layers. The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

Delivery, storage, and handling of geotextile shall be in accordance with ASTM D 4873.

1.6.1 Delivery

Chatham County shall be notified a minimum of 24 hours prior to delivery and unloading of geotextile rolls. Rolls shall be packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, rolls shall be immediately rewrapped with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Each roll shall be labeled with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.6.2 Storage

Rolls of geotextile shall be protected from construction equipment, chemicals, sparks and flames, temperatures in excess of 160 degrees F, or any other environmental condition that may damage the physical properties of the geotextile. To protect geotextile from becoming saturated, rolls shall either be elevated off the ground or placed on a sacrificial sheet of plastic in an area where water will not accumulate.

1.6.3 Handling

Geotextile rolls shall be handled and unloaded with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Geotextile

Geotextile shall be Nicolon/Mirafi HP 570 or an approved (woven) equivalent.

2.1.2 Thread

Sewn seams shall be constructed with high-strength polyester, nylon, or other approved thread type. Thread shall have ultraviolet light stability equivalent to the geotextile and the color shall contrast with the geotextile.

2.2 MANUFACTURING QUALITY CONTROL SAMPLING AND TESTING

The Manufacturer shall be responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request. Manufacturing quality control sampling and testing shall be performed in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D 4354, Procedure A. Acceptance of geotextile shall be in accordance with ASTM D 4759. Tests not meeting the specified requirements shall result in the rejection of applicable rolls.

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE SAMPLES AND TESTS

3.1.1 Quality Assurance Samples

The Contractor shall provide assistance to Chatham County in the collection of quality assurance samples. Samples shall be collected upon delivery to the site for quality assurance testing in accordance with ASTM D 4354, Procedure B. Lot size for quality assurance sampling shall be considered to be the shipment quantity of the product or a truckload of the product, whichever is smaller. The unit size shall be considered one roll of geotextile. Samples shall be identified with a waterproof marker by manufacturer's name, product identification, lot number, roll number, and machine direction. The date and a unique sample number shall also be noted on the sample. The outer layer of the geotextile roll shall be discarded prior to sampling a roll. Samples shall then be collected by cutting the full-width of the geotextile sheet a minimum of 3 feet long in the machine direction. Rolls which are sampled shall be immediately resealed in their protective covering.

3.1.2 Quality Assurance Tests

The Contractor shall provide quality assurance samples to an Independent Laboratory. Test method ASTM D 4355 shall not be performed on the collected samples. Geotextile product acceptance shall be based on ASTM D 4759. Tests not meeting the specified requirements shall result in the rejection of applicable rolls.

3.2 INSTALLATION

3.2.1 Subgrade Preparation

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile. Subgrade materials and compaction requirements shall be in accordance with Section 02300 "EARTHWORK."

3.2.2 Placement

The Contractor shall notify Chatham County a minimum of 24 hours prior to installation of geotextile. Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall also be free of tensile stresses, folds, and wrinkles. On slopes steeper than 10 horizontal on 1 vertical, the geotextile shall be laid with the machine direction of the fabric parallel to the slope direction.

3.3 SEAMS

3.3.1 Overlap Seams

Geotextile panels shall be continuously overlapped a minimum of 12 inches at all longitudinal and transverse joints. Where seams must be oriented across the slope, the upper panel shall be lapped over the lower panel. If approved, sewn seams may be used instead of overlapped seams.

3.3.2 Sewn Seams

The stitch type used shall be a 401 locking chain stitch or as recommended by the manufacturer. For field and factory seams which are sewn, the Contractor shall provide at least a 2-meter sample of sewn seam before the geotextile is installed. For seams that are field sewn, the seams

shall be sewn using the same equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, samples of seams from both directions shall be provided. Quality Assurance seam samples shall be provided to Chatham County. The thread at the end of each seam run shall be tied off to prevent unraveling. Skipped stitches or discontinuities shall be sewn with an extra line of stitching with a minimum of 18 inches of overlap.

3.4 PROTECTION

The geotextile shall be protected during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed. Adequate ballast (e.g. sand bags) shall be used to prevent uplift by wind. The geotextile shall not be left uncovered for more than 14 days after installation.

3.5 REPAIRS

Torn or damaged geotextile shall be repaired. Clogged areas of geotextile shall be removed. Repairs shall be performed by placing a patch of the same type of geotextile over the damaged area. The patch shall extend a minimum of 12 inches beyond the edge of the damaged area. Patches shall be continuously fastened using approved methods. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Geotextile rolls which cannot be repaired shall be removed and replaced. Repairs shall be performed at no additional cost to Chatham County.

3.6 COVERING

Geotextile shall not be covered prior to inspection and approval by Chatham County. Rip Rap shall be placed in a manner that prevents soil from entering the geotextile overlap zone, prevents tensile stress from being mobilized in the geotextile, and prevents wrinkles from folding over onto themselves. On side slopes, rip rap shall be placed from the bottom of the slope upward. Rip rap shall not be dropped onto the geotextile from a height greater than 3 feet. No equipment shall be operated directly on top of the geotextile without approval of Chatham County. Rip rap material type, compaction, and testing requirements are described in Section 2300, "Earthwork." Equipment placing rip rap shall not stop abruptly, make sharp turns, spin their wheels, or travel at speeds exceeding 5 mph.

End of Section 02373

SECTION 02456

PRECAST/PRESTRESSED CONCRETE SHEET PILING

PART 1 – GENERAL

1.1 SUMMARY

Work under this section includes requirements for furnishing and installing precast prestressed concrete sheet piles. The Contractor shall furnish all labor, materials, equipment, utilities and incidental items necessary to provide precast prestressed concrete sheet piles indicated on the project drawings and specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991; R 2002) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214R	(2002) Evaluation of Strength Test Results of Concrete
ACI 301	(1999) Specifications for Structural Concrete for Buildings
ACI 318M	(2002) Building Code Requirements for Structural Concrete and Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1998) Structural Welding Code - Reinforcing Steel
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AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM A 416/A 416M	(2002) Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A 421/A 421M	(2002) Uncoated Stress-Relieved Steel Wire for Prestressed Concrete
ASTM A 615/A 615M	(2004b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 706/A 706M	(2004b) Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 82	(2002) Steel Wire, Plain, for Concrete Reinforcement
ASTM C 109/C 109M	(2002) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. [50-mm] Cube Specimens)
ASTM C 136	(2004) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143/C 143M	(2003) Slump of Hydraulic Cement Concrete
ASTM C 150	(2004a) Portland Cement

ASTM C 172	(2004) Sampling Freshly Mixed Concrete
ASTM C 31/C 31M	(2003a) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(2003) Concrete Aggregates
ASTM C 39	(1993a) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 227	(2003) Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C 260	(2001) Air-Entraining Admixtures for Concrete
ASTM C 295	(2003) Petrographic Examination of Aggregates for Concrete
ASTM C 494/C 494M	(2004) Chemical Admixtures for Concrete
ASTM C 595/C 595M	(2000; Rev A) Blended Hydraulic Cements
ASTM C 618	(2003) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 1107 / C 1107M	(2008) Standard Specification for packaged dry, hydraulic-cement grout (non-shrink)

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(1999) Quality Control for Plants and Production of Structural Precast Concrete Products
PCI STD-112	(1984) Standard Prestressed Concrete Piles Square, Octagonal and Cylinder

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01300, "Submittals."

1.3.1 Shop Drawings

A. Sheet Piles

Prepare in accordance with ACI 315. Indicate placement of reinforcement including tendons. Indicate location of special embedded or attached lifting devices, employment of pickup points, support points other than pickup points and any other methods of pickup. Shop drawing shall identify the type of tendons that will be used, initial prestress, final prestress and minimum compressive strength of concrete at transfer, handling and driving.

1.3.2 Design Data

A. Concrete mix design

Submit a concrete mix design before sheet piles are cast. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, ground slag, and admixtures; and applicable reference specifications.

B. Design Calculations

Submit calculations prepared by a Registered Professional Engineer in the State of Georgia that verify the concrete sheet piles can withstand the minimum bending moment, while maintaining the permissible compression and tension stress shown on the construction drawings and as required by code.

1.3.3 Statements

A. Precasting manufacturer's quality control procedures

Submit precasting manufacturer's quality control procedures established in accordance with PCI MNL-116.

B. Pile Driving Equipment and Methods

Submit descriptions of pile driving equipment to be employed in the work for approval. Descriptive information shall include manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet and template. Submit all equipment, materials, and procedures for the installation of the concrete sheet piles. The Contractor shall follow the requirements specified in the paragraph entitled, "Wave Equation Analyses" of this section in selecting the pile driving equipment and methods. Sheet Pile Installation Plan shall include sequence of sheet pile installation indicating starting point and direction of male and female joints.

C. Calcium nitrite manufacturer's representative

Provide statement from the manufacturer of the calcium nitrite that the manufacturer's representative will be present at the mix plant to insure proper mix and batching methods.

1.3.4 Test Reports

A. Aggregates

Prior to pile fabrication, submit certified test reports for the following tests specified in ASTM C 33 and ASTM C 227:

- 1) Grading
- 2) Amount of material finer than No. 200 sieve
- 3) Alkali reactivity
- 4) Concrete Compressive Strength

B. Concrete Mix Design

Submit concrete cylinder compressive strength test results for concrete sheet piles.

C. Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan.

1.3.6 Certificates

A. Portland Cement

Certification identifying cement; brand name, type, mill location, quantity to be used, size of lot represented by quality control sample, lot number, and destination of shipment.

B. Concrete Mix Design

Certify that proportioning of mix is in accordance with ACI 211.1 or ACI 318 for specified strength and is based on aggregate data which has been determined by laboratory tests during last twelve months.

C. Reinforcing Steel

D. Prestressing Steel

1.3.7 Closeout Submittals

A. Sheet Pile Driving Records

1.4 REQUIREMENTS

1.4.1 Piling

Provide prestressed concrete piles, PCI JR-382.

1.4.2 Pile Lengths and Quantity

Base bids upon the number, size, capacity, and length of piles as indicated.

Should total number of piles or number of each length vary from that specified as the basis for bidding, an adjustment in the contract price and time for completion will be made. Adjustments in contract price will not be made for cutting off piles for any portion of a pile remaining above cut-off elevation; or for broken, damaged, or rejected piles.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 Cement

ASTM C 150, Type II or ASTM C 595, Type IP(MS) blended cement except as modified herein. The blended cement shall consist of a mixture of ASTM C 150 Type II cement, and ASTM C 618 pozzolan or fly ash. The pozzolan or fly ash content shall not exceed 20 percent by weight of the total cementitious material. For exposed concrete, use one manufacturer for each type of cement, fly ash, and pozzolan.

2.1.1.1 Fly Ash and Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Types N and F. Add with cement.

2.1.2 Water

Use potable water.

2.1.3 Aggregates

ASTM C33, except as modified herein. Furnish aggregates for from one source. Aggregates shall not contain any substances which may be deleteriously reactive with the alkalis in the cement. Aggregates shall show expansions less than 0.1 percent at 6 months when tested in accordance with ASTM C 227 using a cement with an alkali content above 0.8 percent (expressed as sodium oxide), and shall not possess properties or constituents that are know to have specific unfavorable effects in concrete when tested in accordance with ASTM C 295.

2.1.4 Admixtures

Calcium chloride shall not be used as an admixture.

2.1.4.1 Air-Entraining

ASTM C 260

2.1.4.2 Accelerating

ASTM C 494, Type C

2.1.4.3 Retarding

ASTM C 494, Type B, D, or G

2.1.4.4 Water Reducing

ASTM C 494, Type A, E, or F

2.1.4.5 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C 494, Type F and ASTM C 1017

2.1.4.6 Calcium Nitrate

ASTM C 494, Type C

2.1.5 Prestressing Steel

Use seven-wire stress relieved strand conforming to ASTM A 416/A 416M. Use prestressing steel free of grease, oil, wax, paint, soil, dirt, and loose rust. Do not use prestressing strands or wire having kinks, bends, or other defects.

2.1.6 Reinforcing Steel

ASTM A 615/A 615M, Grade 60 or ASTM A 706/A 706M. Weld reinforcing steel in accordance with AWS D1.4.

2.1.7 Ties

ASTM A 615/A 615M, Grade 60

2.1.8 Non-Shrink Grout

Provide non-shrink cementitious for sheet pile joints. Non-shrink grout shall conform to ASTM C 1107 / C 1107M and shall have a minimum 28 day compressive strength of 7,000 psi.

2.2 CONCRETE MIX DESIGN

2.2.1 Contractor-Furnished Mix Design

ACI 211.1, ACI 301, and ACI 318 except as otherwise specified. The compressive strength (f_c) of the concrete shall be as indicated and as specified below.

Location	f_c (Min. 28 Day Comp. Strength) (psi)	ASTM C 33 Maximum Nominal Aggregate (Size No.)	Range of Slump (inches)	Maximum Water- Cement Ratio (Maximum by weight)	Minimum Cementitious Material (lb/cy)	Minimum Portland Cement (lb/cy)
Precast / Prestressed Concrete Sheet Piles	7,000	57	4 to 5	0.40	675	505

Maximum slump shown above may be increased one inch for methods of consolidation other than vibration. Slump may be increased to 7 inches when superplasticizers are used. Provide air entrainment using air-entraining admixture. Air entrainment shall be within plus or minus 1.5 percent of the value specified. The water soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days shall not exceed 0.15.

2.2.1.2 Required Average Strength of Mix Design

The Selected mixture shall produce an average compressive strength exceeding the specified strength by the amount indicated in ACI 301. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation shall be calculated and the required average compressive strength shall be determined in accordance with ACI 301. When a concrete production facility does not have a suitable record of tests to establish a standard deviation, the required average strength shall be 8,400 psi:

2.2.2 Calcium Nitrite Corrosion Inhibitor

Calcium nitrite corrosion inhibitor shall be added to the concrete mix for all sheet piles. For calcium nitrite, the rate of application shall be sufficient to provide chloride protection of not less than 13.0 pounds of chloride ion protection per cubic yard. The hardened concrete shall contain no less than 6.8 pounds per cubic yard of nitrite (NO_2). Units with calcium nitrite in a quantity less than specified shall be subject to rejection.

The Contractor shall furnish one concrete cylinder for every 100 cubic yards of concrete produced in order to verify the concentration of calcium nitrite in hardened concrete. Concrete failing to contain calcium nitrite at the required concentrations as tested shall be subject to rejection.

Any air-entraining, water-reducing, and/or set-controlling admixtures used in the production of concrete mixtures for concrete shall be compatible with calcium nitrite solutions.

The Contractor shall strictly adhere to the manufacturer's written recommendations regarding the use of the admixture including storage, transportation and method of mixing. The calcium nitrite which acts as an accelerator may be used in conjunction with the retarder to control the set of concrete, as per manufacturer's recommendation.

2.3 FABRICATION OF PRETENSIONED SHEET PILES

2.3.1 Formwork

Provide forms of metal, braced and stiffened against deformation, accurately constructed, watertight, and supported on unyielding casting beds. Forms shall permit movement of pile without damage during release of prestressing force. Form precast dowel holes with galvanized flexible metal conduit.

2.3.2 Pretensioning

Measure tension to which steel is to be pretensioned by jack pressure read on a calibrated gage and verify by elongation of steel. Provide means for measuring elongation of steel to nearest 1/8 inch. When difference between results of measurement and gage reading is more than 5 percent, determine cause of discrepancy and correct. Give tensioning steel a uniform prestress prior to being brought to design prestress. Induce same initial prestress in each unit when several units of prestressing steel in a pile are stretched simultaneously.

2.3.3 Casting

2.3.3.1 Conveying

Clean conveying equipment thoroughly before each run. Convey concrete from mixer to forms as rapidly as practicable by methods which will not cause segregation or loss of ingredients. Deposit concrete as nearly as practicable to its final position. During placing, make any free vertical drop of the concrete less than 3 feet. Remove concrete which has segregated in conveying or placing.

2.3.3.2 Placing and Casting

Perform concrete casting within 3 days after pretensioning steel; however, do not deposit concrete in forms until placement of reinforcement and tendons have been inspected and approved by pile manufacturer's quality control representative. Produce each pile of dense concrete straight with smooth surfaces with reinforcement retained in its proper position during fabrication. Use vibrator with heads smaller than the minimum distance between steel for pretensioning. Make surface of pile ends perpendicular to axis of pile. Chamfer, between 3/4 inch and 1 1/8 inch, at ends of piles and corners of squared or cornered piles.

2.3.4 Curing of Piles

Cure piles using moist or accelerated curing.

2.3.4.1 Moist Curing

Moist cure using moist burlap coverings, plastic sheeting, or membrane curing compound until minimum strength to detention is achieved.

2.3.4.2 Accelerated Curing

After placement of concrete, moist cure for a period of 4 hours. Accelerated cure until concrete has reached specified release strength. Enclose casting bed for accelerated curing with a suitable enclosure. During application of steam or heat, increase the air temperature at a rate not to exceed 40 degrees F per hour. Cure at a maximum temperature of 150 degrees F until concrete has reached specified release strength. Reduce temperature at a rate not to exceed 20 degrees F per hour until a temperature of 20 degrees F above ambient air temperature is reached. After accelerated curing, moist cure using either water or membrane curing until a total accelerated and moist curing time of 72 hours is achieved.

2.3.5 Detensioning

Perform releasing of prestressed steel in pretensioned piles in such an order that eccentricity of prestress will be minimized. Gradually release tension in strands from anchorage. Detension after approval by pile manufacturer's quality control representative. Perform transfer of prestressing force when concrete has reached a minimum compressive strength determined by the sheet pile designer.

2.4 EQUIPMENT

2.4.1 Wave Equation Analyses

Retain an independent geotechnical engineer experienced in wave equation analysis of piles driven into similar soils as this project to perform the work. The geotechnical engineer shall be a Registered Professional Engineer in the State of Georgia and shall be approved prior to commencing the work.

The Geotechnical Engineer shall perform an initial wave equation analysis that accurately reflects the Contractor's proposed driving system. The analyses should consider, at a minimum, the following:

- A. Hammer impact velocity
- B. Hammer energy
- C. Hammer ram weight
- D. Hammer ram stroke
- E. Driving helmet and cushion
- F. Hammer cushion or capblock
- G. Pile size, weight and length
- H. Character of subsurface material to be encountered
- I. Pile stresses during driving (compression and tension)
- J. Pile penetration

2.4.2 Pile Hammers

Use a pile hammer having delivered force or energy suitable for the total weight of the pile and the character of subsurface material to be encountered. Operate hammer at the rate(s) recommended by the manufacturer throughout the entire driving period. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy.

2.4.3 Driving Helmets and Cushion Blocks

2.4.3.1 Driving Helmets or Caps and Pile Cushions

Use a steel driving helmet or cap including a pile cushion between top of pile and driving helmet or cap to prevent impact damage to pile. Use a driving helmet or cap and pile cushion combination capable of protecting pile head, minimizing energy absorption and dissipation, and transmitting hammer energy uniformly over top of pile. Provide driving helmet or cap fit sufficiently loose around top of pile so that pile may be free to rotate without binding within driving helmet. Use pile cushion of solid wood or of laminated construction using plywood, softwood or hardwood boards with grain parallel to end of pile. Provide pile cushion with thickness between 3 and 12 inches. Replace pile cushion when it becomes charred or burned or has become spongy or deteriorated in any manner. Replace used hammer cushions reduced to half their original thickness with new cushions.

2.4.3.2 Hammer Cushion or Capblock

Use a hammer cushion or capblock between driving helmet or cap and hammer ram consisting of aluminum and micarta (or equal) discs stacked alternately in a steel housing. Use steel plates at top and bottom of capblock. Replace aluminum or micarta discs that have become damaged, split or deteriorated in any manner. Do not use small wood blocks, wood chips, rope or other materials that permit excessive loss of hammer energy.

2.5 PRODUCT QUALITY CONTROL

Where piling is manufactured in a plant with an established quality control program as attested to by a current certification in the PCI "Certification Program for Quality Control" perform product quality control in accordance with PCI MNL-116. Where piling is manufactured by specialists or in plants not currently enrolled in the PCI "Certification Program for Quality Control," set-up a product quality control system in accordance with PCI MNL-116 and perform concrete and aggregate quality control testing using an independent commercial testing laboratory approved by Chatham County in accordance with the following.

2.5.1 Aggregate Tests

Take samples of fine and coarse aggregate at concrete batch plant and test. Perform mechanical analysis (one test for each aggregate size) in accordance with ASTM C 136. Tabulate results of tests in accordance with ASTM C 33.

2.5.2 Strength Tests

Sample concrete in accordance with ASTM C 172 at time concrete is deposited for each production line. Perform slump tests in accordance with ASTM C 143/C 143M. Mold cylinders in accordance with ASTM C 31/C 31M. Mold at least six cylinders per day or one for every 20 cubic yards of concrete placed, whichever is greater. Cure cylinders in same manner as piles and for accelerated curing, place at coolest point in casting bed. Perform strength tests in accordance with ASTM C 39. Test two cylinders of each set at 7 days or 14 days, or at a time for establishing transfer of prestressing force (release strength) and removal of pile from forms. Test remaining cylinders of each set 28 days after molding.

2.5.3 Changes in Proportions

If, after evaluation of strength test results, compressive strength is less than specified compressive strength, make adjustments in proportions and water content and changes in temperature, moisture, and curing procedures as necessary to secure specified strength. Submit changes in mix design to Chatham County in writing.

2.5.4 Compressive Strength Test Results

Evaluate compressive strength test results at 28 days in accordance with ACI 214R using a coefficient of variation of 10 percent. Evaluate strength of concrete by averaging test results of each set of standard cylinders tested at 28 days. Not more than 10 percent of individual cylinders tested shall have a compressive strength less than specified average compressive strength.

PART 3 - EXECUTION

3.1 PILE DRIVING

3.1.1 Driving Piles

Drive piles to indicated tip elevation. During initial driving and until pile tip has penetrated beyond layers of very soft soil, use a reduced driving energy of the hammer. If a pile fails to reach indicated tip elevation, notify Chatham County and perform corrective measures as directed. Contractor shall provide and operate noise monitoring equipment at the project site during pile driving operations. Provide hearing protection when noise levels exceed 140 dB. Piles or pile sections shall not be handled or moved in any manner that would result in cracking or permanent damage to the sheet piles. Piles shall not be driven until the concrete has attained a minimum strength of 7000 psi. All pile driving schedules shall be coordinated with Chatham County.

3.1.2 Protection of Piles

Take care to avoid damage to piles during handling, placing pile in leads, and during pile driving operations. Support piles laterally during driving, but allow rotation in leads. Square the top of pile to longitudinal axis of pile. Maintain axial alignment of pile hammer with that of the pile. Use a special driving head to drive piles having strands or mild steel reinforcement projecting from head.

3.1.3 Templates

Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining sheet piling in the correct position during setting and driving. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Provide at least two levels of support. Templates shall not move when supporting sheet piling. Fit templates with wood or UHMW blocking to bear against the sheet piles and hold the sheet piles at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the sheets from warping or wandering from the alignment. Mark template for the location of the leading edge of each alternate sheet pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means must be used to keep the sheet pile vertical along its leading edge.

PDA Testing – Perform PDA test on first driven sheetpile to verify pile is not overstressed by the contractor's pile driving operations.

3.1.4 Tolerances in Driving

Drive piles with a variation of not more than 2 percent from vertical for plumb piles. Maintain and check axial alignment of pile and leads at all times. If subsurface conditions cause pile drifting beyond allowable axial alignment tolerance, notify Chatham County and perform corrective measures as directed. Place butts within 4 inches of location indicated. Manipulation of piles within specified tolerances is permitted, to a maximum of 1 1/2-percent of their exposed length above ground surface or mudline. In addition to specified tolerances, maintain a location to provide a clear distance of at least 5 inches from butt to edge of pile cap. If clear distance can not be maintained, then notify Chatham County. Check each pile for heave. Redrive heaved

piles to required point elevation. Cut-off elevation shall not deviate from elevation indicated by more than 1-1/2 inch.

3.1.5 Cutting

With Chatham County approval, piles driven to refusal or the point where additional penetration cannot be attained and are extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Piles driven below the required top elevation and piles damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation as directed by Chatham County. Pile cut-offs shall become the property of the Contractor and shall be removed from the site. Do not use explosives for cutting.

3.1.6 Splices

Splicing of piles is not permitted.

3.1.7 Build-Ups

3.1.7.1 Pretensioned Piles

Piles that are damaged or driven below their intended butt elevation shall be replaced or built-up as directed by Chatham County at the contractor's expense.

3.1.8 Pile Cut-Off

Cut off piles with a smooth level cut using pneumatic tools, sawing, or other suitable methods approved by Chatham County. Use of explosives for cutting is not permitted.

3.1.9 Sheet Pile Joint

Following acceptable installation of sheet piles, flush the female-female joints to remove soil which may be present. As soon as practicable after flushing the joint, fill the joint with 7,000 psi non-shrink grout.

3.2 FIELD QUALITY CONTROL

3.2.1 Pile Records

For each driven pile, keep a record of the number of blows required for each foot of penetration and number of blows for the last 6 inches penetration or fraction thereof. Include in the record the beginning and ending times of each operation during driving of pile, type and size of hammer used, rate of operation, stroke or equivalent stroke for diesel hammer, type of driving helmet, and type and dimension of hammer cushion (capblock) and pile cushion used. Record unusual occurrences during pile driving. Notify Chatham County 10 days prior to driving of piles. The following log is a preprinted form for recording pile driving data.

PILE DRIVING LOG

CONTRACT NO. _____ CONTRACT NAME _____

CONTRACTOR _____

TYPE OF PILE _____

PILE LOCATION _____ PILE SIZE: BUTT/TIP: _____ LENGTH _____

GROUND ELEVATION _____ CUT OFF ELEVATION _____

PILE TIP ELEVATION _____ VERTICAL (____) BATTER 1 ON (____)

HAMMER: MAKE & MODEL _____ WT. RAM _____

STROKE _____ RAM RATED ENERGY _____

DESCRIPTION & DIMENSIONS OF DRIVING CAP _____

CUSHION MATERIALS & THICKNESS _____

INSPECTOR _____

"DEPTH" COLUMN OF PILE DRIVING RECORD REFERENCED TO:

_____ CUT-OFF ELEVATION _____ FINISH FLOOR ELEVATION

TIME: START DRIVING _____ FINISH DRIVING _____ DRIVING TIME _____

INTERRUPTIONS (TIME, TIP ELEV. & REASON) _____

ELEVATIONS _____

DRIVING RESISTANCE

DEPTH (FT)	NO. OF BLOWS	DEPTH (FT)	NO. OF BLOWS	DEPTH (FT)	NO. OF BLOWS	DEPTH (FT)	NO. OF BLOWS
0	_____	18	_____	36	_____	54	_____
1	_____	19	_____	37	_____	55	_____
2	_____	20	_____	38	_____	56	_____
3	_____	21	_____	39	_____	57	_____
4	_____	22	_____	40	_____	58	_____
5	_____	23	_____	41	_____	59	_____
6	_____	24	_____	42	_____	60	_____
7	_____	25	_____	43	_____	61	_____
8	_____	26	_____	44	_____	62	_____
9	_____	27	_____	45	_____	63	_____
10	_____	28	_____	46	_____	64	_____
11	_____	29	_____	47	_____	65	_____
12	_____	30	_____	48	_____	66	_____
13	_____	31	_____	49	_____	67	_____
14	_____	32	_____	50	_____	68	_____
15	_____	33	_____	51	_____	69	_____
16	_____	34	_____	52	_____	70	_____
17	_____	35	_____	53	_____	71	_____

SHEET 1 OF 2

DRIVING RESISTANCE IN BLOWS PER INCH FOR LAST FOOT OF PENETRATION:

DEPTH_____

DEPTH_____

1"____2"____3"____4"____5"____6"____7"____8"____9"____10"____11"____12"____

ELEV._____

ELEV._____

REMARKS_____

CUT OFF ELEVATION: FROM DRAWING _____

TIP ELEVATION = GROUND ELEVATION - DRIVEN DEPTH = _____

DRIVEN LENGTH = CUT OFF ELEVATION - TIP ELEVATION = _____

CUT OFF LENGTH = PILE LENGTH - DRIVEN LENGTH = _____

SHEET 2 OF 2

End of Section 02456

SECTION 02460

STEEL H PILES

PART 1 - GENERAL

1.1 SUMMARY

Work under this section consists, in general, of furnishing all labor, materials, tools, equipment, utilities and incidentals to install all Steel H Piles under the box culvert and wingwalls for the project as indicated on the construction drawings, and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 572/A 572M (2007) High-Strength Low-Alloy Columbium-Vanadium Structural Steel

ASTM D 4945 (2008) Standard Method for High-Strain Dynamic Testing of Piles

AMERICAN WELDING SOCIETY, INC. (AWS)

AWS D1.1 (2008) Structural Welding Code - Steel

1.3 SUBMITTALS

Submit the following in accordance with the Section 01300, "Submittals."

1.3.1 Certificates

A. Material Certificates

Submit for each shipment, a certificate identified with specific lots prior to installing the piling. Identification data should include piling type, dimensions, chemical composition, mechanical properties, section properties, heat number, and mill identification mark.

1.3.2 Shop Drawings

A. Box Culvert and Wingwall H Piles

Submit fabrication drawings showing layout(s) and connections to structural system.

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of steel, and dimensions. Show construction details in relation to proposed structural system.

1.3.3 Pile Driving Equipment and Methods

Submit descriptions of pile driving equipment to be employed in the work to Chatham County for approval. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet and templates. Submit all equipment, materials, and procedures for installation of the Steel H Piles. The Contractor shall follow the requirements specified in the Paragraph entitled, "Wave Equation Analyses" of this section in selecting the pile driving equipment and methods.

1.3.4 Closeout Submittals

A. Pile driving records

Submit complete and accurate job pile records as specified in paragraph entitled "Records" of this section, within 15 calendar days after completion of driving.

1.4 BASIS FOR BIDS

Base bids on the number, size, and length of piles from tip to cutoff as indicated. Should the total number of piles or number of each length vary from that specified as the basis for bidding, an adjustment in the contract price and time of completion will be made. Adjustment in contract price will not be made for pile splices, cutting off piles, disposing of pile cut offs, or for damaged, or rejected piles.

PART 2 - PRODUCTS

2.1 BOX CULVERT AND WINGWALL PILES

ASTM A 572/A 572M, Grade 50. Pile tips shall be square and blunt, as received from the mill.

2.1.1 Coating

Coat the top 15 feet of all piles with two (2) coats using an owner approved coal tar epoxy. The total dry film thickness shall be 16 mils. Follow the manufacturer's instructions for preparing steel and applying coating.

2.2 EQUIPMENT

2.2.1 Wave Equation Analyses

Retain an independent geotechnical engineer experienced in wave equation analysis of piles driven into similar soils as this project to perform the work. This shall be deemed the "Contractor's Geotechnical Engineer." The Contractor's Geotechnical Engineer shall be a professional engineer registered in the State of Georgia and shall be approved by the Owner prior to commencing the work.

The Contractor's Geotechnical Engineer shall perform an initial wave equation analyses that accurately reflects the Contractor's proposed driving system. The analyses should consider, at a minimum, the following:

- A. Hammer impact velocity
- B. Hammer energy

- C. Hammer ram weight
- D. Hammer ram stroke
- E. Driving helmet and cushion
- F. Hammer cushion or capblock
- G. Pile size, weight and length
- H. Character of subsurface material to be encountered
- I. Pile stresses during driving (compression and tension)
- J. Pile penetration

2.2.2 Pile Hammers

Furnish a hammer capable of developing the indicated ultimate pile capacity considering hammer impact velocity; ram weight; stiffness of hammer and pile cushions; cross-section, length and total weight of pile; and the character of subsurface material to be encountered. Operate hammer at the rate(s) recommended by the manufacturer throughout the entire driving period. The Contractor may need to modify the driving equipment depending on localized conditions. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy. The use of a vibrating hammer to install the H piles is acceptable. Contractor shall provide a suitable hammer for dynamic testing as required if a vibratory hammer is used.

2.2.3 Driving Helmets and Cushion Blocks

2.2.3.1 Driving Helmets or Caps and Pile Cushions

Use a steel driving helmet or cap including a pile cushion between top of pile and driving helmet or cap to prevent impact damage to pile. Use a driving helmet or cap and pile cushion combination capable of protecting pile head, minimizing energy absorption and dissipation, and transmitting hammer energy uniformly over top of pile. Provide driving helmet or cap fit sufficiently loose around top of pile so that pile may be free to rotate without binding within driving helmet. Use pile cushion of solid wood or of laminated construction using plywood, softwood or hardwood boards with grain parallel to end of pile. Provide pile cushion with thickness of 6 inches minimum and 14 inches maximum. Replace pile cushion when it becomes highly compressed, charred or burned, or has become spongy or deteriorated in any manner. Show details of driving helmets, capblocks, and pile cushions.

2.2.3.2 Hammer Cushion or Capblock

Use a hammer cushion or capblock between driving helmet or cap and hammer ram consisting of aluminum and micarta (or equal) discs stacked alternately in a steel housing. Use steel plates at top and bottom of capblock. Replace aluminum or micarta discs that have become damaged, split or deteriorated in any manner. Do not use small wood blocks, wood chips, rope or other materials that permit excessive loss of hammer energy.

PART 3 - EXECUTION

3.1 INSTALLATION

Inspect piles when delivered and when in the leads immediately before driving. Piles shall be handled so as to protect pile coatings. Repair damage or defects in pile coatings as specified. Cut piles at intended butt elevation by an approved method.

3.1.1 Driving Piles

Drive piles to indicated tip elevation. During initial driving and until pile has penetrated beyond layers of very soft soil, use a reduced driving energy of the hammer. Afterwards, operate hammer at manufacturer's rated speed, and drive pile without interruption indicated tip elevation. If a pile fails to reach indicated tip elevation or if a pile reaches tip elevation without reaching required driving resistance, notify Owner and perform corrective measures as directed. Provide hearing protection when noise levels exceed 140 dB. All pile driving schedules shall be coordinated with Chatham County.

3.1.2 Driving Equipment

Place hammer cushion or cap block between ram and the pile cap or drive cap. Hammer cushion or cap block shall have consistent elastic properties, shall minimize energy absorption, and shall transmit hammer energy uniformly and consistently during the entire driving period. Do not use a pile cushion block.

3.2 TOLERANCES IN DRIVING

At cutoff elevation, butts shall be within 2 inches of the location indicated. A variation of not more than 0.25 inch per foot of pile length from the vertical for plumb piles will be permitted. Inspect piles for heave. Redrive heaved piles to the required tip elevation. Remove and replace with new piles those damaged, mislocated, driven below the design cutoff, or driven out of alignment, or provide additional piles, driven as directed.

3.3 JETTING OF PILES

Jetting shall not be permitted.

3.4 PREDRILLING

Pre-drilling shall not be permitted.

3.5 LONG PILES

Handle and drive piles of a high slenderness ratio carefully to prevent overstress. Provide pile driving rig with rigid supports so that leads remain accurately aligned.

3.6 SPLICES

When approved, provide splices of the full penetration butt weld type or proprietary prefabricated splicer sleeves. Use only one splice per length of pile. Avoid field splices for lengths under 80 feet. Construct splices to maintain the true alignment and position of the pile sections. Splices shall develop the full strength of the pile in both bearing and bending.

3.7 WELDING

AWS D1.1.

3.8 PILE DYNAMIC TESTING

A. Contractor's Geotechnical Engineer shall conduct Pile Driving Analyzer™ (PDA) Testing on indicated piles. The piles indicated on the drawings shall be PDA tested both during initial installation and then retested during restriking five (5) days after initial installation. Sequence pile driving to maintain access to piles that are designated for restriking.

- B. As indicated above and on the drawings, PDAs will be performed on the first piles driven in order to verify the WEAP analysis. If the stresses exceed what was anticipated with the WEAP Analysis then the Contractor shall adjust the driving procedure as necessary.

3.8.1 PDA Testing

Indicated pile capacities should be verified through dynamic pile testing with a PDA following ASTM D 4945. For piles driven to bear in the in-situ marl, the ultimate capacity is usually not reflected in the dynamic measurements during initial driving, but rather at some time following driving as excess pore pressures dissipate and the pile sets up. Therefore, PDA monitoring during initial installation can confirm that driving stresses are within the acceptable range and a restrike test will confirm the pile capacity.

3.9 RECORDS

The Contractor's Geotechnical Engineer shall keep a complete and accurate record of each pile driven. Indicate the pile location, deviations from design location, cross section shape and dimensions, original length, ground elevation, tip elevation, cutoff elevation, penetration in blows per foot for the entire length of penetration, hammer data including rate of operation, make, and size, and unusual pile behavior or circumstances experienced during driving such as redriving, heaving, weaving, obstructions, and unanticipated interruptions. Preprinted forms for recording pile driving data are attached below.

PILE DRIVING LOG

DATE _____
CONTRACT NO. _____ CONTRACT NAME _____
CONTRACTOR _____ TYPE OF PILE _____
PILE LOCATION _____ PILE SIZE: BUTT/TIP: _____ LENGTH _____
GROUND ELEVATION _____ CUT OFF ELEVATION _____
PILE TIP ELEVATION _____ VERTICAL (____) BATTER 1 ON (____)
SPICES ELEVATION _____ COMPANY _____

HAMMER: MAKE & MODEL _____ WT. RAM _____
STROKE _____ RAM RATED ENERGY _____
DESCRIPTION & DIMENSIONS OF DRIVING CAP _____
CUSHION MATERIALS & THICKNESS _____

INSPECTOR _____

"DEPTH" COLUMN OF PILE DRIVING RECORD REFERENCED TO:

_____ CUT-OFF ELEVATION
_____ FINISH FLOOR ELEVATION

TIME: START DRIVING _____ FINISH DRIVING _____ DRIVING TIME _____
INTERRUPTIONS (TIME, TIP ELEV. & REASON) _____
JET PRESSURE & ELEVATIONS _____

DRIVING RESISTANCE

DEPTH FT.	NO. OF BLOWS	DEPTH FT.	NO. OF BLOWS	DEPTH FT.	NO. OF BLOWS
0	_____	18	_____	36	_____
1	_____	19	_____	37	_____
2	_____	20	_____	38	_____
3	_____	21	_____	39	_____
4	_____	22	_____	40	_____
5	_____	23	_____	41	_____
6	_____	24	_____	42	_____
7	_____	25	_____	43	_____
8	_____	26	_____	44	_____
9	_____	27	_____	45	_____
10	_____	28	_____	46	_____
11	_____	29	_____	47	_____
12	_____	30	_____	48	_____
13	_____	31	_____	49	_____
14	_____	32	_____	50	_____
15	_____	33	_____	51	_____
16	_____	34	_____	52	_____
17	_____	35	_____	53	_____

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54	_____	77	_____	99	_____
55	_____	78	_____	100	_____
56	_____	79	_____	101	_____
57	_____	80	_____	102	_____
58	_____	81	_____	103	_____
59	_____	82	_____	104	_____
60	_____	83	_____	105	_____
61	_____	84	_____	106	_____
62	_____	85	_____	107	_____
63	_____	86	_____	108	_____
64	_____	87	_____	109	_____
65	_____	88	_____	110	_____
66	_____	89	_____	111	_____
67	_____	90	_____	112	_____
68	_____	91	_____	113	_____
69	_____	92	_____	114	_____
70	_____	93	_____	115	_____
71	_____	94	_____	116	_____
72	_____	95	_____	117	_____
73	_____	96	_____	118	_____
74	_____	97	_____	119	_____
75	_____	98	_____	120	_____
76	_____				

DRIVING RESISTANCE IN BLOWS PER INCH FOR LAST FOOT OF PENETRATION:

DEPTH _____ DEPTH _____
 1" _____ 2" _____ 3" _____ 4" _____ 5" _____ 6" _____ 7" _____ 8" _____ 9" _____ 10" _____ 11" _____ 12" _____
 ELEV. _____ ELEV. _____

REMARKS _____

CUT OFF ELEVATION: FROM DRAWING _____

TIP ELEVATION = GROUND ELEVATION - DRIVEN DEPTH = _____

DRIVEN LENGTH = CUT OFF ELEVATION - TIP ELEVATION = _____

CUT OFF LENGTH = PILE LENGTH - DRIVEN LENGTH = _____

SHEET 2 OF 2

End of Section 02460

SECTION 02510
WATER DISTRIBUTION

PART 1 – GENERAL

1.1 SUMMARY

The work under this section consists, in general, of furnishing all labor, materials, tools, equipment, and incidentals for providing the water distribution system indicated on the construction drawings and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B301	(2004) Liquid Chlorine
AWWA C110/A21.10	(2008) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	(2005) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C151/A21.51	(2002; Errata 2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C153/A21.53	(2006) Ductile-Iron Compact Fittings for Water Service
AWWA C500	(2002; R 2003) Metal-Seated Gate Valves for Water Supply Service
AWWA C502	(2005) Dry-Barrel Fire Hydrants
AWWA C508	(2001) Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS
AWWA C509	(2001) Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(2005) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains
AWWA M23	(2002) Manual: PVC Pipe - Design and Installation
AWWA M9	(1995) Manual: Concrete Pressure Pipe

ASME INTERNATIONAL (ASME)

ASME B16.1	(2005) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASTM INTERNATIONAL (ASTM)	
ASTM A 536	(1984e1; R 2004) Standard Specification for Ductile Iron Castings
ASTM D 1557	(2002e1) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³) (2700 kN-m/m ³)
ASTM D 1785	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2005) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2167	(1994; R 2001) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2774	(2008) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1996; R 2002) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 2922	(2004) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(2004) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM F 402	(2005) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)	
MSS SP-80	(2008) Bronze Gate, Globe, Angle and Check Valves
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 24	(2006) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
UNDERWRITERS LABORATORIES (UL)	
UL 246	(1993; Rev thru Dec 1998) Hydrants for Fire-Protection Service
UL 262	(2004) Standard for Gate Valves for Fire-Protection Service
UL 312	(2004) Check Valves for Fire-Protection Service

UL 789

(2004; Rev thru Aug 2008) Indicator Posts for Fire-Protection
Service

UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-3

(1992) Recommended Practice for the Installation of Polyvinyl
Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch)

1.3 DESIGN REQUIREMENTS

1.3.1 Water Distribution Mains

Provide water distribution mains indicated as 8 inch diameter lines of ductile-iron or polyvinyl chloride (PVC) pipe. Provide water main accessories as specified and where indicated.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES for review by Chatham County before ordering materials:

A. Product Data

1. Piping Materials
2. Water distribution main piping, fittings, joints, and couplings

Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on joints. Include information concerning gaskets with submittal for joints and couplings.

B. Design Data

1. Design calculations of water piping

C. Test Reports

1. Bacteriological Disinfection
2. Test results from commercial laboratory verifying disinfection

D. Certificates

1. Water distribution main piping, fittings, joints, valves, and coupling
2. Shop-applied lining

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

E. Manufacturer's Instructions

1. Delivery, storage, and handling
2. Installation procedures for water piping

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Materials on site shall be stored in enclosures or under protective covering. Plastic piping, jointing materials and rubber gaskets shall be stored under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.5.2 Handling

Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place any other material or pipe inside a pipe or fitting after the coating has been applied. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to Chatham County. Rubber gaskets that are not to be installed immediately shall be stored under cover and out of direct sunlight.

PART 2 – PRODUCTS

2.1 WATER DISTRIBUTION MAIN MATERIALS

2.1.1 Piping Materials

2.1.1.1 Ductile-Iron Piping

- A. Pipe and Fittings: Pipe, except flanged pipe, AWWA C151/A21.51, Pressure Class 350. Flanged pipe, AWWA C115/A21.15. Fittings, AWWA C110/A21.10 or AWWA C153/A21.53 fittings with push-on joint ends conforming to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved, for push-on joint. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining, AWWA C104/A21.4, twice the standard thickness.
- B. Joints and Jointing Material:
 1. Joints: Joints for pipe and fittings shall be push-on joints or mechanical joints unless otherwise indicated. Provide mechanical joints where indicated.
 2. Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly, AWWA C111/A21.11.
 3. Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets, AWWA C111/A21.11.

4. Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to AWWA C115/A21.15. Flange for setscrewed flanges shall be of ductile iron, ASTM A 536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250. Setscrews for setscrewed flanges shall be 190,000 psi tensile strength, heat treated and zinc-coated steel. Gasket and lubricants for setscrewed flanges, in accordance with applicable requirements for mechanical-joint gaskets specified in AWWA C111/A21.11. Design of setscrewed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.
5. Insulating Joints: Designed to effectively prevent metal-to-metal contact at the joint between adjacent sections of piping. Joint shall be of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers. Gasket shall be of the dielectric type, full face, and in other respects as recommended in the Appendix to AWWA C115/A21.15. Bolts and nuts, as recommended in the Appendix to AWWA C115/A21.15.
6. Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

2.1.1.2 Polyvinyl Chloride (PVC) Plastic Piping

A. Pipe and Fittings:

Pipe, AWWA C900, shall be plain end or gasket bell end, Pressure Class 200 (DR 14) with cast-iron-pipe-equivalent OD. Fittings shall be gray iron or ductile iron, AWWA C110 or AWWA C153, and have cement-mortar lining, AWWA C104, standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe specified in this paragraph.

B. Joints and Jointing Material:

Joints for pipe shall be push-on joints, ASTM D 3139. Joints between pipe and metal fittings, valves, and other accessories shall be push-on joints ASTM D 3139, or compression-type joints/mechanical joints, ASTM D 3139 and AWWA C111. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe, ASTM F 477. Gaskets for push-on joints and compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, AWWA C111, respectively, for push-on joints and mechanical joints. Mechanically coupled joints using a sleeve-type mechanical coupling, as specified in paragraph entitled "Sleeve-Type Mechanical Couplings," may be used as an optional jointing method in lieu of push-on joints on plain-end PVC plastic pipe, subject to the limitations specified for mechanically coupled joints using a sleeve-type mechanical coupling and to the use of internal stiffeners as specified for compression-type joints in ASTM D 3139.

2.1.2 Water Main Accessories

2.1.2.1 Sleeve-Type Mechanical Couplings

Couplings shall be designed to couple plain-end piping by compression of a ring gasket at each end of the adjoining pipe sections. The coupling shall consist of one middle ring flared or beveled at each end to provide a gasket seat; two follower rings; two resilient tapered rubber gaskets; and bolts and nuts to draw the follower rings toward each other to compress the gaskets. The middle ring and the follower rings shall be true circular sections free from irregularities, flat spots, and surface defects; the design shall provide for confinement and compression of the gaskets. For ductile iron and PVC plastic pipe, the middle ring shall be of cast-iron. Gaskets shall be designed for resistance to set after installation and shall

meet the applicable requirements specified for gaskets for mechanical joint in AWWA C111. Bolts shall be track-head type, ASTM A 307, Grade A, with nuts, ASTM A 563M ASTM A 563, Grade A; or round-head square-neck type bolts, ANSI B18.5.2.1M and ASME B18.5.2.2M with hex nuts, ASME B18.2.2. Bolts shall be 16 mm 5/8 inch in diameter; manufacturer's recommendation shall be used when considering minimum number of bolts for each coupling. Bolt holes in follower rings shall be of a shape to hold fast the necks of the bolts used. Mechanically coupled joints using a sleeve-type mechanical coupling shall not be used as an optional method of jointing except where pipeline is adequately anchored to resist tension pull across the joint.

2.1.2.2 Tracer Wire for Nonmetallic Piping

Provide bare copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 General Requirements for Installation of Pipelines

These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

3.1.1.1 Location of Water Lines

Terminate the work covered by this section at a point approximately 5 feet from the building. Where the location of the water line is not clearly defined by dimensions on the drawings, do not lay water line closer horizontally than 10 feet from any sewer line. Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing. Do not lay water lines in the same trench with gas lines.

A. Water Piping Installation Parallel With Sewer Piping

1. Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.
2. Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:
 - a. The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.
 - b. Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling. Approved waste water disposal method shall be utilized.
 - c. The sewer manhole shall be of watertight construction and tested in place.

B. Installation of Water Piping Crossing Sewer Piping

1. Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.

2. Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:
 - a. Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.
 - b. Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.
 - c. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 02300, "EARTHWORK."

3.1.1.3 Pipe Laying and Jointing

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installations. Depth of cover over top of pipe shall not be less than 2 ½ feet.

3.1.1.4 Installation of Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such a manner that it will not be displaced during construction operations.

3.1.1.5 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.

3.1.2 Special Requirements for Installation of Water Mains

3.1.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

- A. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11. Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrew flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrew flange manufacturer. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.
- B. Allowable Deflection: The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.
- C. Pipe Anchorage: Provide metal harness for pipe anchorage. Metal harness shall be in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps as shown in NFPA 24.

3.1.3 Disinfection

Prior to disinfection, obtain Chatham County approval of the proposed method for disposal of waste water from disinfection procedures. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Prior to hydrostatic testing, obtain Chatham County approval of the proposed method for disposal of waste water from hydrostatic testing. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Testing Procedure

Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test ductile-iron water mains and water service lines in accordance with the requirements of AWWA C600 for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints or push-on joints shall not exceed the amounts given in AWWA C600; no leakage will be allowed at joints made by any other method. Test PVC plastic water mains and water service lines made with PVC plastic pipe in accordance with the requirements of UBPPA UNI-B-3 for pressure and leakage tests. The amount of leakage on pipelines made of PVC plastic water pipe shall not exceed the amounts given in UBPPA UNI-B-3, except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed. Test water service lines in accordance with applicable requirements of AWWA C600 for hydrostatic testing. No leakage will be allowed at flanged joints.

3.2.3 Special Testing Requirements

For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than 2 inches in diameter, hydrostatic test pressure shall be not less than 200 psi. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test. A Chatham County representative must be present during this test.

3.3 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

*** End of Section 02510***

SECTION 02531

SANITARY SEWERS

PART 1 – GENERAL

1.1 SUMMARY

The work under this section consists, in general, of furnishing all labor, materials, tools, equipment, and incidentals for providing the sanitary sewer system indicated on the construction drawings and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105	(1999) Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1219 mm), for Water
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153	(2000) Ductile-Iron Compact Fittings for Water Service
AWWA C600	(1999) Installation of Ductile-Iron Water Mains and Their Appurtenances

ASTM INTERNATIONAL (ASTM)

ASTM A 746	(2003) Ductile Iron Gravity Sewer Pipe
ASTM C 270	(2004a) Mortar for Unit Masonry
ASTM C 443	(2003) Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 478	(2003a) Precast Reinforced Concrete Manhole Sections
ASTM C 923	(2002) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C 924	(2002) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C 969	(2002) Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines

ASTM C 972	(2000) Compression-Recovery of Tape Sealant
ASTM C 990	(2003a) Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D 2321	(2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D 2412	(2002) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D 3034	(2004) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 4101	(2004a) Polypropylene Injection and Extrusion Materials
ASTM D 412	(1998a; R 2002e1) Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 624	(2000e1) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM F 949	(2003) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-60005	(Basic) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.27	Fixed Ladders
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UNI-BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI-B-6	(1998) Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
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1.3 SYSTEM DESCRIPTION

1.3.1 Sanitary Sewer Gravity Pipeline

Provide mains of ductile-iron or polyvinyl chloride (PVC) pipe. Provide the system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified and where indicated.

1.4 GENERAL REQUIREMENTS

The Contractor shall replace damaged material and redo unacceptable work at no additional cost to Chatham County. Backfilling shall be accomplished after inspection by Chatham County. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and

shall follow these instructions unless directed otherwise by Chatham County. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.5 SUBMITTALS

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES for review by Chatham County before ordering materials:

A. Shop Drawings

1. Installation and As-Built drawings, as specified
2. Precast concrete manhole
3. Metal items
4. Frames and covers

B. Product Data

1. Pipeline Materials

Submit manufacturer's standard drawings or catalog cuts.

C. Test Reports

1. Test and inspection reports, as specified

D. Certificates

1. Portland Cement

Certificates of compliance stating the type of cement used in precast manholes.

2. Gaskets

Certificates of compliance stating that the fittings or gaskets used for waste lines designated on the plans are resistant.

E. Manufacturer's Instructions

1. Delivery, storage, and handling
2. Installation procedures for sanitary sewer gravity pipeline.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery and Storage

1.6.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping, jointing materials, and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.6.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.6.1.3 Cement, Aggregate and Reinforcement

As specified in Section 03300 CAST-IN-PLACE CONCRETE.

1.6.2 Handling

Handle pipe, fittings, and other accessories in such a manner as to ensure delivery to the trench in sound undamaged condition. Carry, do not drag, pipe to trench.

1.7 DRAWINGS

Sign and seal As-Built Drawings by a Professional Surveyor and Mapper. Include following statement: "All potable water lines crossed by sanitary hazard mains are in accordance with the permitted utility separation requirements."

PART 2 – PRODUCTS

2.1 PIPELINE MATERIALS

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Ductile Iron Gravity Sewer Pipe and Associated Fittings

2.1.1.1 Ductile Iron Gravity Pipe and Fittings

Ductile iron pipe shall conform to ASTM A 746. Fittings shall conform to AWWA C110 or AWWA C153. Fittings shall have strength at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the joints specified hereinafter. Pipe and fittings shall have cement-mortar lining conforming to AWWA C104, standard thickness.

2.1.1.2 Ductile Iron Gravity Joints and Jointing Materials

Pipe and fittings shall have push-on joints, except as otherwise specified in this paragraph. Mechanical joints only shall be used where indicated. Push-on joint pipe ends and fitting ends, gaskets, and lubricant for joint assembly shall conform to AWWA C111. Mechanical joint requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA C111.

2.1.2 PVC Plastic Gravity Sewer Piping

2.1.2.1 PVC Plastic Gravity Pipe and Fittings

ASTM D 3034, SDR 35, or ASTM F 949 with ends suitable for elastomeric gasket joints.

2.1.2.2 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.2 CONCRETE MATERIALS

2.2.1 Cement Mortar

Cement mortar shall conform to ASTM C 270, Type M with Type II cement.

2.2.2 Portland Cement Concrete

As specified in Section 03300 CAST-IN-PLACE CONCRETE.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Precast Concrete Manholes

Precast concrete manhole risers, base sections, and tops shall conform to ASTM C 478; base and first riser shall be monolithic.

2.3.2 Gaskets and Connectors

Gaskets for joints between manhole sections shall conform to ASTM C 443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C 923 or ASTM C 990.

2.3.3 External Preformed Rubber Joint Seals

An external preformed rubber joint seal shall be an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" shall be tested for leakage in the same manner as pipelines as described in paragraph entitled "Leakage Tests." The seal shall be multi-section with a neoprene rubber top section and all lower sections made of Ethylene Propylene Di Monomer (EPDM) rubber with a minimum thickness of 1.5 mm 60 mils. Each unit shall consist of a top and bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be a non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. Extension sections shall cover up to two more adjusting rings. Properties and values are listed in the following tables:

Properties, Test Methods and Minimum Values for
Rubber used in Preformed Joint Seals

Physical Properties	Test Methods	EPDM	Neoprene	Butyl Mastic
Tensile, psi	ASTM D 412	1840	2195	—
Elongation, percent	ASTM D 412	553	295	350
Tear Resistance, pli	ASTM D 624 (Die B)	280	160	—
Rebound, percent, 5 minutes	ASTM C 972 (mod.)	—	—	11
Rebound, percent, 2 hours	ASTM C 972	—	—	12

2.3.4 Metal Items

2.3.4.1 Frames, Covers, and Gratings for Manholes

FS A-A-60005, cast iron; figure numbers shall be as follows:

A. Traffic manhole:

Frame: Figure 1, Size 22A

Cover: Figure 8, Size 22A

Steps: Figure 19

Frames and covers shall be cast iron, ductile iron or reinforced concrete. Cast iron frames and covers shall be as indicated or shall be of type suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 181.4 kg 400 pounds. Reinforced concrete frames and covers shall be as indicated or shall conform to ASTM C 478. The word "Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.3.4.2 Manhole Steps

Zinc-coated steel conforming to 29 CFR 1910.27. As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D 4101, copolymer polypropylene. Rubber shall conform to ASTM C 443, except shore A durometer hardness shall be 70 plus or minus 5. Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.

2.4 REPORTS

Submit Test Reports. Compaction and density test shall be in accordance with Section 02300 EARTHWORK. Submit Inspection Reports for daily activities during the installation of the sanitary system. Information in the report shall be detailed enough to describe location of work and amount of pipe laid in place, measured in linear feet.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

These general requirements apply except where specific exception is made in the following paragraphs entitled "Special Requirements".

3.1.1.1 Location

The work covered by this section shall terminate at a point approximately 5 feet from the building. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water main or service line. Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.

A. Sanitary piping installation parallel with water line:

1. Normal conditions: Sanitary piping or manholes shall be laid at least 3 m 10 feet horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.
 2. Unusual conditions: When local conditions prevent a horizontal separation of 3 m 10 feet, the sanitary piping or manhole may be laid closer to a water line provided that:
 - a. The top (crown) of the sanitary piping shall be at least 450 mm 18 inches below the bottom (invert) of the water main.
 - b. Where this vertical separation cannot be obtained, the sanitary piping shall be constructed of AWWA-approved ductile iron water pipe pressure tested in place without leakage prior to backfilling.
 - c. The sewer manhole shall be of watertight construction and tested in place.]
- B. Installation of sanitary piping crossing a water line:
1. Normal conditions: Lay sanitary sewer piping by crossing under water lines to provide a separation of at least 18 inches between the top of the sanitary piping and the bottom of the water line whenever possible.
 2. Unusual conditions: When local conditions prevent a vertical separation described above, use the following construction:
 - a. Sanitary piping passing over or under water lines shall be constructed of AWWA-approved ductile iron water pipe, pressure tested in place without leakage prior to backfilling.
 - b. Sanitary piping passing over water lines shall, in addition, be protected by providing:
 1. A vertical separation of at least 18 inches between the bottom of the sanitary piping and the top of the water line.
 2. Adequate structural support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of the water line.
 3. That the length, minimum 20 feet, of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.
- C. Sanitary sewer manholes: No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 02300, EARTHWORK.

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for

installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

3.1.1.4 Connections to Existing Lines

Obtain approval from Chatham County before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.1.2 Special Requirements

3.1.2.1 Installation of Ductile-Iron Piping

Unless otherwise specified, install pipe and associated fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of AWWA C600 for pipe installation and joint assembly.

- A. Make push-on joints with the gaskets and lubricant specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical-joints with the gaskets, glands, bolts, and nuts specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111.
- B. Exterior protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet in accordance with AWWA C105, using polyethylene film.

3.1.2.2 Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.1.3 Concrete Work

Cast-in-place concrete is included in Section 03300, CAST-IN-PLACE CONCRETE. The pipe shall be supported on a concrete cradle, or encased in concrete where indicated or directed.

3.1.4 Manhole Construction

Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, either pour bottom slabs and walls integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in

accordance with the recommendations of the connector manufacturer. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

3.1.5 Miscellaneous Construction and Installation

3.1.5.1 Connecting to Existing Manholes

Pipe connections to existing manholes shall be made so that finish work will conform as nearly as practicable to the applicable requirements specified for new manholes, including all necessary concrete work, cutting, and shaping. The connection shall be centered on the manhole. Holes for the new pipe shall be of sufficient diameter to allow packing cement mortar around the entire periphery of the pipe but no larger than 1.5 times the diameter of the pipe. Cutting the manhole shall be done in a manner that will cause the least damage to the walls.

3.1.5.2 Metal Work

- A. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well-defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.
- B. Field painting: After installation, clean cast-iron frames, covers, gratings, and steps not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Chatham County will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically full circle of light through the pipeline when viewed from the adjoining end of line. When pressure piping is used in a nonpressure line for nonpressure use, test this piping as specified for nonpressure pipe.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

- A. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials in accordance with ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969.
- B. Low-pressure air tests: Perform tests as follows:
 - 1. Ductile-iron pipelines: Test in accordance with the applicable requirements of ASTM C 924. Allowable pressure drop shall be as given in ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924.
 - 2. PVC plastic pipelines: Test in accordance with UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

3.2.2.2 Deflection Testing

Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D 2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

- A. Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:
 - 1. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
 - 2. Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 4 degrees C 39.2 degrees F, and shall have a surface Brinell hardness of not less than 150.
 - 3. Center bored and through-bolted with a 6 mm 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.
 - 4. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
- B. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.
- C. Pull-through device procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.

- D. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

3.2.3 Field Tests for Concrete

Field testing requirements are covered in Section 03300 CAST-IN-PLACE CONCRETE.

3.3 CLEANUP

Upon completion of the installation of sewer pipelines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

*** End of Section 02531***

SECTION 02630
STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

The work under this section consists, in general, of furnishing all labor, materials, tools, equipment, and incidentals for providing for the installation of drop inlets, reinforced concrete pipe drains, and other related utilities.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 198 (2003) Joints for Concrete Pipe, Manholes, and Precast Box Sections
Using Preformed Flexible Joint Sealants

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 48/A 48M (2003) Gray Iron Castings

ASTM A 536 (1984; R 2004) Ductile Iron Castings

ASTM C 139 (2003) Concrete Masonry Units for Construction of Catch Basins and
Manholes

ASTM C 231 (2004) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 270 (2004a) Mortar for Unit Masonry

ASTM C 32 (2004) Sewer and Manhole Brick (Made from Clay or Shale)

ASTM C 425 (2004) Compression Joints for Vitrified Clay Pipe and Fittings

ASTM C 443 (2003) Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

ASTM C 478 (2003a) Precast Reinforced Concrete Manhole Sections

ASTM C 55 (2003) Concrete Brick

ASTM C 62 (2004) Building Brick (Solid Masonry Units Made from Clay or Shale)

ASTM C 76 (2004a) Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

ASTM C 789 (2000) Precast Reinforced Concrete Box Sections for Culverts, Storm
Drains, and Sewers

ASTM C 877	(2002) External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C 923	(2002) Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D 1557	(2002e1) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(2004a) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2167	(1994; R 2001) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2922	(2004) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(2004) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.3 MEASUREMENT AND PAYMENT

1.3.1 Pipe Culverts

The length of pipe installed will be measured along the centerlines of the pipe from end to end of pipe. Additional pipe will be paid for at the contract unit price for the number of linear feet of culverts placed in the accepted work.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01300 "Submittals."

1.4.1 Product Data

A. Placing Pipe

Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

1.4.2 Certificates

A. Pipeline Testing

B. Hydrostatic Test on Watertight Joints

C. Determination of Density

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless directed otherwise by Chatham County.

1.5.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 - PRODUCTS

2.1 PIPE FOR CULVERTS

Pipe for culverts shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Concrete Pipe

ASTM C 76, Class III, Wall B, Lifting holes are not allowed.

2.2 MISCELLANEOUS MATERIALS

2.2.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 5000 psi concrete under Section 03300 "Cast-in-Place Concrete." The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C 231. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

2.2.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.2.3 Joints

2.2.3.1 Flexible Watertight Joints

- A. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Factory-fabricated resilient joint materials shall conform to ASTM C 425. Gaskets shall have not more than one factory-fabricated

splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.

B. Test Requirements: See Section 01600.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS

Excavation of trenches, and for appurtenances and backfilling for culverts, shall be in accordance with the applicable portions of Section 02300 "Earthwork" and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside width of the pipe plus 12 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified. Contractor shall not over excavate.

3.1.2 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in Section 02300 "Earthwork."

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to Chatham County.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

Concrete pipe shall be bedded in a stone foundation accurately shaped to conform to the lowest one-fourth of the outside portion of pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

3.3.1 Concrete Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.4 JOINTING

3.4.1 Concrete Pipe

3.4.1.1 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.5 BACKFILLING

3.5.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 12 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of Chatham County, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.5.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches.

3.5.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or

storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.5.4 Compaction

3.5.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.5.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

- A. Under pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.
- B. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
- C. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.5.5 Determination of Density

Testing shall be the responsibility of the Contractor and performed at no additional cost to Chatham County. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017 or ASTM D 2922. Test results shall be furnished Chatham County. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

End of Section 02630

SECTION 02704

GRADED AGGREGATE BASE COURSE (GABC)

PART 1 – GENERAL

1.1 SUMMARY

Work under this section includes requirements for providing a dense graded aggregate base course for the new asphalt pavement on the project. The Contractor shall furnish all labor, equipment and utilities to complete the work as indicated on the project drawings and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

GEORGIA DEPARTMENT OF TRANSPORTATION (GDOT)

GDOT (2001) State of Georgia - Standard Specifications for Construction of Transportation Systems

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01300 "Submittals"

- A. Materials Source: Submit name of graded aggregate base course material supplier and location of source 15 days prior to delivery. Provide materials from the same source throughout the work. Change of source requires Engineer's approval.
- B. Letter of Certification: The material supplier shall furnish a letter to Chatham County certifying that the dense graded aggregate base course has been tested by an independent testing laboratory and the material complies with specification requirements. Copies of substantiating test reports shall also be provided.
- C. Compaction Test Reports: Contractor shall submit all compaction test results performed in accordance with GDOT Section 310.3.06.

1.4 WEATHER LIMITATION

Construction shall be done when the atmospheric temperature is above 35 degrees F. Completed areas damaged by rainfall or other weather conditions shall be corrected to meet specified requirements.

1.5 EQUIPMENT AND TOOLS

All equipment and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 2 – PRODUCTS

2.1 AGGREGATE

- A. The aggregate shall be free of salt, vegetable matter and other extraneous matter, and conforming to the requirements of GDOT Sections 310 and 815.2.01 of the Standard Specifications for Group II aggregate.

- B. Gradation

<u>SIEVE SIZE</u>	<u>PERCENT PASSING BY WEIGHT</u>	
	<u>MINIMUM</u>	<u>MAXIMUM</u>
2 in.	100	
1½ in.	97	100
¾ in.	60	90
No. 10	25	45
No. 60	5	30
No. 200	4	11

- C. Recycled Materials: Reclaimed concrete and aggregate base materials will be allowed provided the material meets the specifications.

2.2 EQUIPMENT

- A. Equipment shall be in accordance with GDOT Section 310 of the Standard Specifications.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

- A. When the GABC is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms; except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 STOCKPILING MATERIAL

- A. Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by Chatham County to prevent segregation. Materials obtained from different sources shall be stockpiled separately and approved by the Engineer.

3.3 PREPARATION

- A. Prior to constructing the GABC, the underlying course or subgrade shall be cleaned of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances immediately before placement of the graded aggregate base. No materials shall be placed on muddy or frozen surfaces. The underlying course shall conform to Section 02300, "Earthwork." Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the GABC is placed.

3.4 INSTALLATION

- A. General

Graded aggregate base courses shall be constructed in accordance with GDOT Section 310 of the Standard Specifications, except as herein modified.

- B. Placing

The base material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or be less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or level required with the least possible surface disturbance. Where the GABC is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable GABC.

- C. Grade Control

The finished and completed GABC shall conform to the lines, grades, and cross sections shown. Underlying materials shall be excavated and prepared at sufficient depth for the required (GABC) thickness so that the finished GABC with the subsequent surface course will meet the designated grades.

- D. Moisture Content

When the base material does not contain the proper moisture content to insure the required density, wetting or drying operations must be performed. When water is added to the base material, it shall be uniformly mixed to the full depth of the course.

- E. Compaction

Each layer of the GABC shall be compacted as specified with approved compaction equipment. Ensure that the moisture content of materials is uniformly distributed and allows compaction to the specified density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is

at least 100 percent of maximum dry density, Modified Proctor. At least 4 density determinations shall be made by the Contractor's Testing Laboratory on each course for each day's completed work; other density determinations shall be performed as directed by Chatham County. No material shall be spread until density determinations have been performed on the underlying course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

F. Thickness

Compacted thickness of the aggregate course shall be as indicated on the drawings. The total compacted thickness of the GABC shall be within $\frac{1}{2}$ inch of the thickness indicated. Where the measured thickness is more than $\frac{1}{2}$ inch deficient, such areas, shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompact as directed. Where the measured thickness is more than $\frac{1}{2}$ inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within $\frac{1}{4}$ inch of the thickness indicated. The total thickness of the GABC course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

G. Finishing

The surface of the top layer of GABC shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of GABC is $\frac{1}{2}$ inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompact or it shall be replaced as directed.

H. An accumulation of large size aggregates will not be permitted in the finished surface of the dense graded aggregate base. Determination of this condition shall be the opinion of Chatham County. This condition may be the result of excessive handling, low stockpiles or other conditions. When in the opinion of Chatham County this condition exists, the Contractor shall remove the effected area a minimum of 4 inches deep and replace with new material that meets the gradation requirements. The new material shall be compacted in accordance with Paragraph 3.4.E.

I. Smoothness

The finished surface of the base shall be checked using a 15 foot straightedge. Surface elevations shall not exceed $\frac{1}{4}$ inch at any point. Measurements shall be taken in successive positions to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding $\frac{1}{4}$ inch can be surveyed to determine if base material need to be added/removed to correct the grade or areas can be cored to determine stone thickened and to make corrections. The Contractor shall bare all costs associated with determination and corrective measure.

3.5 TRAFFIC

A. Traffic shall not be allowed on the completed aggregate course.

3.6 MAINTENANCE

- A. The GABC shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any GABC that is not paved over prior to the onset of winter shall be retested to verify that it still complies with the requirements of this specification. Any area of GABC that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.7 DISPOSAL OF UNSATISFACTORY MATERIALS

- A. Any unsuitable materials that must be removed shall be disposed of by the Contractor or as directed. No additional payments will be made for materials that must be replaced.

3.8 FIELD ENGINEERING:

- A. The Contractor shall be solely responsible for all field engineering required for construction, furnishing all lines, grades, and control points necessary for construction, starting from control points and elevations furnished by Chatham County or shown on the plans.

End of Section 02704

SECTION 02745

HOT MIX ASPHALT CONCRETE PAVEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

The work to be performed under this section shall consist of furnishing labor, materials, equipment and services necessary to construct asphalt concrete pavement, including aggregate base to the section and at the locations as specified in this section and as indicated on the Contract Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM D 698	(1991) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600kN-m/cu. m.))
ASTM D 1188	(1989) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2726	(1990) Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

GEORGIA DEPARTMENT OF TRANSPORTATION (GDOT)

GDOT	(2001) State of Georgia - Standard Specifications for Construction of Transportation Systems
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**AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO – 2005)**

AASHTO M320	(2005) Performance Graded Asphalt Binder
AASHTO MP2	(2005) Specification for Superpave Volumetric Mix Design
AASHTO T30	(2005) Mechanical Analysis of Extracted Aggregate
AASHTO T164	(2005) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
AASHTO T166	(2005) Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens

AASHTO T209	(2005) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T269	(2005) Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
AASHTO T312	(2005) Preparing and Determining the Density of Hot Mix Asphalt Specimens by Means of the SHRP Gyratory Compactor

1.3 SURVEY LAYOUT

- A. The Contractor shall be responsible for horizontal and vertical control for all work contained in the contract.
- B. All surveys shall be performed and stamped by a third-party professional land surveyor registered in the State of Georgia, and acceptable to Chatham County. The surveys shall be constructed in such a manner that demonstrates that the Contractor has built each sequence of work as described in the Contract Documents. It is the responsibility of the Contractor to schedule Contractor's surveys and to verify that the contract requirements have been met prior to proceeding to the next sequence of work.
- C. Topographic surveys shall include spot elevations and 0.50 foot contours. Surveys points shall be taken at 10 foot intervals along the site perimeter, at the location of site structures, and on a 25 foot (maximum) grid elsewhere. The acceptable vertical survey tolerance shall be 0.25 inch.
- D. For evaluation of asphalt paving work, surveys shall be completed following installation of aggregate base course, immediately prior to placement of the final lift of asphalt pavement, and following placement of the final lift of asphalt pavement.

1.4 CONTRACTOR QUALITY CONTROL

- A. The Contractor shall be responsible for developing the asphalt mix designs specified herein using an AASHTO and GDOT accredited testing laboratory.
- B. Sampling and testing for compliance with the contract provisions shall be in accordance with the applicable reference standards using an approved independent testing laboratory.
- C. The Contractor shall conduct testing on a lot basis. A lot shall consist of the entire volume of asphalt per course. Each lot shall be divided up into four equal sublots.
- D. Samples for testing shall be taken by the Contractor. A random number table shall be used to determine the particular portion of each mix to be sampled. Samples of mix shall not be split.
- E. The test results determined by the Contractor shall be reviewed by Chatham County and used to determine the acceptability of the in place asphalt concrete mix.
 - 1. Mix composition: The size of the lot for mix composition testing will be the same as the size of the lot for density testing. Each lot shall be equally divided up into four equal sublots. Samples for mix composition testing will be taken by the Contractor from mix placed by the paver according to GDOT's GSP 15 and GDOT 73 (Method C).
 - a. Using the sample material placed by the paver, the Contractor shall prepare the laboratory compacted test specimens according to AASHTO T312 and provide

Chatham County with a printout of all data generated by the gyratory compaction equipment. One set of laboratory compacted specimens will be prepared at the specified design number of gyrations, for each subplot. The sample of bituminous mixture shall be maintained at a temperature at or above the specified compaction temperature for a period of no less than 30 minutes. If necessary, the sample shall be placed in an oven, for not more than 60 minutes, to bring the samples to the proper compaction temperature. The compaction temperatures shall be as specified in the job mix formula.

- b. Theoretical Maximum Density (TMD): Using the uncompacted portion of the specimen taken from behind the paver, the Contractor shall determine the TMD of each subplot in accordance with AASHTO T209. The TMD shall be used by the Contractor for calculation of mat and joint density.
- c. Binder Content: Using the uncompacted portion of the sample taken from behind the paver, the Contractor shall determine the binder content of each subplot in accordance with AASHTO T164.
- d. Aggregate Gradation: Using the aggregate recovered from the binder content determination in Section 1.4.D.1.c, the Contractor shall determine the aggregate gradation of the extracted material in accordance with AASHTO T30.
- e. Air Voids: From the laboratory compacted specimens, the Contractor shall determine the air voids of each subplot in accordance with AASHTO T269.
- f. Voids in Mineral Aggregate (VMA): From the laboratory compacted specimens, the Contractor shall determine the VMA of each subplot in accordance with AASHTO T312.
- g. Dust to binder ratio: From the laboratory compacted specimens, the Contractor shall determine the dust to effective binder ratio of each subplot.
- h. Mixture composition acceptance limits: The acceptance of the plant produced asphalt concrete mixture shall be based on the average value of the various mix properties for the four sublots in the lot. Those mix properties include: aggregate gradation, asphalt binder content, air void content, and voids in mineral aggregate content of the plant produced mixture. The acceptance criteria for individual sublots shall be twice the tolerance values for the lot.

The average mix composition test results on the plant produced mix for each lot shall not deviate from the job mix formula by more than the tolerance limits shown in the following table. The average value of the aggregate gradation for the plant produced mixture for each lot, however, shall not exceed the broad band limits for each particular mixture as provided in Section 2.

Sieve, mm	12.5 mm Nominal Maximum Aggregate		19 mm Nominal Maximum Aggregate	
	Min	Max	Min	Max
25			-8.0%	+8.0%
19	-8.0%	+8.0%	-8.0%	+8.0%
12.5	-6.0%	+6.0%	-8.0%	+8.0%
9.5	-5.6%	+5.6%	-5.6%	+5.6%
4.75	-5.6%	+5.6%	-5.6%	+5.6%
2.36	-4.6%	+4.6%	-4.6%	+4.6%
0.075	-2.0%	+2.0%	-2.0%	+2.0%
% Asphalt Cement	-0.4%	+0.4%	-0.4%	+0.4%

2. **Mat Density:** The density of the compacted asphalt concrete mixture shall be determined from either 4 inch or 6 inch diameter cores cut and tested by the Contractor from each pavement layer. The size of the lot for density testing shall be the same as the lot size for mix composition testing. Each lot shall be divided into four equal sublots. Two cores shall be cut from each sublot.

Core samples shall be taken from each sublot using a table of random numbers. One random number shall be used to determine the longitudinal location of each pair of cores and a second random number shall be used to determine the transverse location for each pair of cores in the sublot. The two cores in each sublot shall be cut approximately 6 inches apart, in a longitudinal direction, from the nearest edge of one core to the nearest edge of the second core. The Contractor shall repair the area from which the cores were removed the same day.

The bulk specific gravity of each core shall be determined by the Contractor using AASHTO T166, Method A. The bulk specific gravity of each core in the sublot shall be averaged to determine the specific gravity of the asphalt concrete mix in each sublot. The average specific gravity of each sublot shall be combined with the average specific gravity of all sublots in the lot to determine the specific gravity of the lot. The specific gravity of the lot shall be converted to density by multiplying the specific gravity of the lot by 62.245.

The average density of the lot shall be compared to the TMD of the asphalt concrete mix as determined using AASHTO T209, for the same lot of mix. The required average mat density for each lot shall be at least 93.0 percent of the TMD for that lot. The required density of each sublot shall be at least 91.0 percent of the TMD, but not more than 97.0 percent of the TMD.

3. **Joint Density:** The density of the compacted asphalt concrete mixture at the longitudinal joint shall be determined from 6 inch diameter cores cut and tested by the Contractor from each pavement layer. A total of 6 cores shall be cut from each pavement layer for the entire project. Core samples shall be taken from the site using a table of random numbers. The Contractor shall repair the area from which the cores were removed the same day.

The bulk specific gravity of each core shall be determined by the Contractor using AASHTO T166, Method A. The bulk specific gravity of each core in the sublot shall be averaged to determine the specific gravity of the asphalt concrete mix in each sublot. The average specific gravity of each sublot shall be combined with the average specific gravity of all sublots in the lot to determine the specific gravity of the lot. The specific gravity of the lot shall be converted to density by multiplying the specific gravity of the lot by 62.245.

The average density of the lot shall be compared to the TMD of the asphalt concrete mix as determined using AASHTO T209. The TMD used shall be an average of the TMD value for the mix placed on each side of the longitudinal joint at each particular subplot location. The required average longitudinal joint density for each lot shall be at least 91.5 percent of the TMD for that lot. The required density of each subplot shall be at least 89.5 percent of the TMD for that lot but not more than 97.0 percent of the TMD.

4. Layer Thickness: The thickness of each layer shall be measured using the cores cut from each subplot and lot of mix that were taken for mat density measurement. For each core, the thickness of that core shall be measured at four evenly spaced points around the circumference of the core. The thickness measured for each core of the subplot shall be averaged to determine the thickness of the layer in each subplot. The average thickness of the pavement layer in the lot shall be the average of the measurements determined from the four sublots.

Thickness measurements will not be required for asphalt concrete layers which are intended to be variable in thickness such as leveling courses. The required average thickness of pavement layers that are not intended to be variable shall be as follows:
Sublot average: Within minus 0.25 inch to plus 0.5 inch of the design thickness for that particular layer.

Lot average: Within minus 0 inches to plus 0.5 inch of the design thickness for that particular layer.

Cumulative tolerances for total pavement thickness will not be allowed.

5. Surface smoothness: The size of a lot for smoothness testing by straightedge shall be 2,000 square yards. Each lot shall be evaluated with a 10 foot straightedge. Measurements shall be made perpendicular and parallel to the centerline of each paving lane at 25 foot intervals.

The final surface shall be smooth and free from roller marks and sharp irregularities greater than 0.25 inch. Not more than 15 percent of all smoothness measurements within a lot shall exceed a tolerance of plus or minus 3/16 inch over 10 feet.

6. Surface Grade: The size of a lot for surface grade evaluation shall be 2,000 square yards. Each lot shall be evaluated by topographic surveys of the finished pavement surface in accordance with Paragraph 1.3 C.

The final surface shall conform to the lines and grades shown on the contract drawings within a tolerance of plus or minus 0.5 inch, except where closer tolerance is required for proper functioning of appurtenant structures and drainage.

1.5 QUALITY ASSURANCE

- A. Chatham County has the option to hire an Independent Testing Agency to perform Quality Assurance Testing and review the Contractors Quality Control Program. Periodic comparison testing by the Testing Agency may be conducted on each Quality Control Test to monitor consistency of equipment and test procedures. The Testing Agency may take independent samples to monitor the Contractor's quality control program and ensure work quality meets or exceeds the specifications.

1.6 JOB CONDITIONS

A. ENVIRONMENTAL REQUIREMENTS:

1. Asphalt concrete mixture shall only be placed on existing pavement surfaces when the ambient air temperature is at least 40 degrees F and rising for base course mixes and 50 degrees F and rising for surface course mixes.
 2. In case of sudden rain, Chatham County may permit placing of mixture then in transit from the plant provided that the surface upon which the mix is being placed is free from pools of water. In addition, the laydown temperatures must conform to the above requirements. Such permission, however, shall not be interpreted as a waiver of any of the quality requirements.
- B. New and existing manholes, catch basins, and utility vault covers shall be adjusted to conform to the new pavement grades. Paving shall be finished $\frac{1}{4}$ inch to $\frac{1}{2}$ inch higher than adjacent structures, unless otherwise shown or specified.
- C. Existing underground utilities: The Contractor shall locate existing underground utilities in the area of the work. Those utilities which are to remain shall be adequately protected from damage.
- D. All permanent utilities shall be installed prior to final paving. All utility trenches shall be patched with asphalt pavement as shown on the drawings.
- E. Dust control: The Contractor shall be responsible for dust control at the site. As a minimum, a water truck and vacuum truck shall be used on site for dust control when required by Chatham County.

1.7 TERMINOLOGY

- A. Blended aggregate – The combined mixture of coarse aggregate, fine aggregates, and mineral filler.
- B. Coarse aggregate – The aggregate fraction retained on the No. 4 sieve.
- C. Fine aggregate – The aggregate mass fraction passing the No. 4 sieve and retained on the No. 200 sieve.
- D. Flat and elongated particles – Coarse aggregate particles with a maximum to minimum dimension ratio greater than five to one (5:1) as measured by ASTM D 4791.
- E. Nominal maximum aggregate size – One sieve size larger than the first sieve to cumulatively retain more than ten (10) percent of the blended aggregate.
- F. Maximum aggregate size – One sieve size larger than the nominal maximum aggregate size. Typically, the smallest sieve size that allows one hundred (100) percent of the blended aggregate to pass.
- G. Mineral filler – The mass fraction of blended aggregate passing the No. 200 sieve.
- H. Working day – For purposes of testing, working days will consist of Monday through Friday.
- I. Binder Course – None.

1.8 SUBMITTALS

The following shall be submitted in accordance with Section 01300 "Submittals."

1.8.1 Asphalt Concrete Pavement

A. Submit all job mix formula data for each type of asphalt concrete mix, from each plant and each new source of material, at least 20 days prior to the start of production. As a minimum, all job mix formula submittals shall contain the following:

1. Mix designation.
2. Plant location where the mix will be produced.
3. Coarse aggregate certified test reports:
 - a. Source location and type of aggregate.
 - b. Coarse aggregate angularity.
 - c. Bulk and apparent specific gravity.
 - d. Flat and elongated particles.
 - e. Soundness.
 - f. LA abrasion.
4. Fine aggregate certified test reports:
 - a. Source location and type of aggregate.
 - b. Bulk and apparent specific gravity.
 - c. Liquid limit.
 - d. Plastic index.
 - e. Percent natural sand (if used).
 - f. Sand equivalent.
 - g. Soundness.
 - h. LA abrasion.
 - i. Uncompacted void content.
5. Anti-strip agent (if required):
 - a. Certification.
 - b. Amount Used.
6. Proportions and percentage of aggregate.

7. Plot of the blended aggregate gradation and gradation control points on the Federal Highway Administration (FHWA) 0.45 power gradation curve.
 8. Gyrotory compaction curve.
 9. Bulk specific gravity at N_{DESIGN} gyrations.
 10. Air void content at $N_{INITIAL}$, N_{DESIGN} , and N_{MAX} gyrations.
 11. Voids in mineral aggregate at N_{DESIGN} gyrations.
 12. Voids filled with asphalt at N_{DESIGN} gyrations.
 13. Graphical plots of air voids, voids in the mineral aggregate, voids filled with asphalt, fines to effective binder content ratio, and unit weight verses asphalt content. Plots shall indicate values at -0.5 percent design asphalt content, design asphalt content, and +0.5 percent asphalt content.
 14. Tensile strength ratio (TSR) and worksheets.
- B. The certification(s) shall show the appropriate AASHTO/ASTM test(s) for each material, test results, and a statement that the material meets the specification requirement. The certification(s) will be provided by the material supplier or the approved independent testing laboratory.
- C. If requested by Chatham County, submit samples of each type aggregate to be used and from each source with proper identification as to source, type of aggregate and contract number. Take all samples in accordance with requirements of ASTM D 75 and ASTM D 242. Submit in clean, sturdy bags and in the following amounts for each sample when requested.

<u>Material</u>	<u>Sample Size</u>
Coarse Aggregate	25 lbs
Fine Aggregate	25 lbs
Reclaimed Asphalt Pavement	25 lbs
Mineral Filler	5 lbs

- D. Working drawings: For each paving area provide working drawings to show the following information:
1. Direction of paving
 2. Lane widths
 3. Thickness of each lift
- E. Submit smoothness measurements and surface grade survey results to Chatham County prior to application for payment.

1.8.2 Certificates

A. Testing

Qualifications of the independent testing laboratory for approval.

PART 2 - PRODUCTS

2.1 TACK COAT

- A. Tack coat shall be neat PG64-22 or PG67-22 asphalt conforming to the requirements of Section 413 of the GDOT Standard Specifications.

2.2 ANTI-STRIPPING AGENT

- A. If required to meet tensile strength requirements specified herein, the Contractor shall add a suitable anti-stripping agent conforming to GDOT Standard Specifications.

2.3 ASPHALT CEMENT

- A. Asphalt shall conform to the requirements of AASHTO M320 and Section 820 of the GDOT Standard Specifications for the Performance Grade (PG) Specified herein.

2.4 AGGREGATES

- A. Coarse aggregate – Material shall conform to Section 800 and 802 of the GDOT Standard Specifications for Group II, Class 'A' coarse aggregate as modified below:

Test	Specification
Flat and Elongated Particles (ASTM D 4791, Using a Ratio of 5:1)	8%, Maximum
Coarse Aggregate Angularity (ASTM D 5821)	100% with 1 or more fractured faces and 95% with 2 or more fractured faces
LA Abrasion Wear (AASHTO T96, 500 Revolutions)	40%, Maximum
Magnesium Sulfate Soundness Loss (AASHTO T104, 5 Cycles)	15%, Maximum

- B. Fine aggregate – Fine aggregate shall consist of clean, sound, durable, angular shaped particles produced by crushing stone for gravel. Natural (non-manufactured) siliceous sand may be used to obtain the gradation of the aggregate blend or to improve the workability of the mix. The amount of sand to be added will be adjusted to produce mixtures conforming to requirements of this specification. The fine aggregate shall not contain more than 10 percent natural sand by weight of total aggregates. Fine aggregate shall conform to Section 802 of the GDOT Standard Specifications for Group II fine aggregate as modified below:

Test	Specification
LA Abrasion Wear (AASHTO T96, 500 Revolutions)	40%, Maximum
Magnesium Sulfate Soundness Loss (AASHTO T104, 5 Cycles)	18%, Maximum
Sand Equivalent (AASHTO T176)	45%, Minimum
Uncompacted Void Content (AASHTO T304, Method A)	45%, Minimum
Plasticity Index (AASHTO T90)	6, Maximum
Liquid Limit (AASHTO T89)	25, Maximum

- C. Mineral filler shall conform to ASTM D 242 and have a ratio to asphalt by weight not exceeding 1.2.
- D. RECLAIMED ASPHALT PAVEMENT (RAP)
- The maximum proportion of reclaimed asphalt pavement permitted within each mix shall not exceed 10 percent, unless approved by Chatham County.
 - RAP shall have 100 percent passing the 50mm sieve, 95 percent passing the 25mm sieve, and shall be a mixture of only coarse aggregate, fine aggregate, and asphalt cement, free of solvents and other contaminating substances.
 - Fine and coarse aggregate contained in the RAP shall meet the requirements for virgin aggregates outlined above.

E. BLENDED AGGREGATES

- Fine aggregate, coarse aggregates and RAP, when blended, shall not contain more than two (2) percent by mass, clay and other friable particles as determined by AASHTO T112.
- Superpave Gradations: Each gradation contains maximum and minimum control points. Job mix formula gradations must fall within control points for the specified nominal aggregate size. The combined aggregate shall conform to the gradation requirements as set forth in AASHTO MP2 as modified below and tested in accordance with AASHTO T11 and T27. Gradation requirements are shown below:

12.5 mm Nominal Maximum Gradation

Sieve (mm)	Control Points	
	Minimum	Maximum
3/4" (19)		100
1/2" (12.5)	90	100
3/8" (9.5)	70	85
No. 8 (2.36)	34	39
No. 200 (0.075)	3.5	7

19 mm Nominal Maximum Gradation

Sieve (mm)	Control Points	
	Minimum	Maximum
1" (25)		100
3/4" (19)	90	100
1/2" (12.5)	60	89
3/8" (9.5)	55	75
No. 8 (2.36)	29	34
No. 200 (0.075)	3.5	6.0

3. Aggregate for asphalt concrete shall be provided in sufficient sizes to produce a uniform mixture. The Contractor shall indicate on the proposed job-mix formula the separate approximate sizes of aggregate to be used. Not less than two separate coarse and two separate fine aggregate sizes shall be used to produce the blended aggregate mixture.

It is recommended that the Bailey Method of Gradation Evaluation be used to evaluate the packing of aggregate particles and constructability of the blended aggregate mix. If segregation or non-uniformity is evident in the finished pavement, Chatham County reserves the right to require the Contractor to discontinue the use of crusher run or aggregate blends and to furnish separate sizes of open graded aggregate material.

2.5 BITUMINOUS MIX DESIGN

- A. Job mix designs shall be prepared by the Contractor in accordance with AASHTO PP28 as modified herein.

- B. Asphalt binder:

1. Surface course: Asphalt cement meeting the requirements of PG67-22.
2. Binder course: Asphalt cement meeting the requirements of PG67-22.

- C. Aggregate gradation:

Surface course – 12.5 mm nominal maximum aggregate size gradation.

Binder course – 19 mm nominal maximum aggregate size gradation.

- D. Gyration levels for mix preparation shall conform with the following, as set forth in AASHTO PP28:

Mix Designation	N _{INITIAL}	N _{DESIGN}
12.5 mm Surface Course	7	75
19 mm Surface Course	7	75

- E. The voids filled with asphalt (VFA) at the target air void level shall be as follows:

Mix Designation	VFA (Percent)
12.5 mm Surface Course	65-78
19 mm Binder Course	65-78

- F. The voids in mineral aggregate (VMA) of the mix design shall be based on the nominal maximum aggregate size and conform to the requirements shown below:

Nominal Maximum Aggregate Size	Voids in Mineral Aggregate (Percent)
	Minimum
12.5 mm	14
19 mm	13

- G. Temperature requirements for mixing and compaction shall be established by the liquid asphalt supplier. The temperature to which the asphalt must be heated to produce viscosities of 170 +/- 20 centistokes kinematic and 280 +/- 30 centistokes kinematic shall be established as the laboratory mixing and compaction temperature, respectively.
- H. The mix design when compacted in accordance with AASHTO T312, shall meet the density specified below at the initial, design, and maximum compaction levels.

Compaction Level (Number of Gyration)	Required Density (% of Theoretical Maximum Specific Gravity)
N _{INITIAL}	%G _{MM} <= 90.5
N _{DESIGN}	%G _{MM} = 96
N _{MAXIMUM}	%G _{MM} <= 98

- I. The dust to binder ratio shall be between 0.6 and 1.3 for all mix designs.
- J. Compacted mix designs shall have a tensile strength ratio (TSR) greater than or equal to 85 percent when tested in accordance with AASHTO T283. In addition, the mixture shall have a minimum dry tensile strength of 1380 KPA (200 pounds per square inch). In the event the mix design does not meet the tensile requirements the Contractor shall add an approved anti-stripping agent or take other corrective action to satisfy the specification.
- K. Following completion of the volumetric mix design, mixes shall be evaluated for rutting susceptibility. Mixes shall be tested by an approved third-party or state testing laboratory according to GDOT publication GDT 115. Design limits for this test are as follows:

Mix Designation	GDT 115 Rutting Susceptibility Test	
	Test Temperature (°F)	Maximum Deformation (mm)
12.5 mm Surface Course	147	7.0
19 mm Surface Course	147	7.0

In the event a mix does not meet the test requirements for rutting susceptibility, the volumetric mix design shall be adjusted as necessary and the susceptibility tests repeated.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

- A. Asphalt mixing plant – Asphalt shall be produced at a plant approved by the Georgia Department of Transportation (GDOT). Plants shall conform to Section 400 of the GDOT standard specifications, as modified herein.
- B. Hauling Equipment:
 - 1. Hauling equipment shall conform to Section 400.2.01 of the GDOT standard specifications.
 - 2. Trucks shall be equipped with tarps, in good condition without holes, which can be tied down over the sides and ends of the truck beds during periods of inclement weather to prevent rain from entering the truck bed and coming in contact with the asphalt concrete mix.
 - 3. Trucks shall be loaded using a multiple-drop method (front then back then middle) to minimize truck to truck segregation.
- C. Transfer equipment – Provide and use a material transfer vehicle (MTV) to independently deliver asphalt mixtures from the hauling equipment to the paving equipment. When Chatham County determines the use of the MTV is not practical for a portion of the project he may waive its requirement for that portion. As a minimum, the MTV shall possess the following characteristics:
 - 1. High capacity truck unloading system, capable of 600 tons per hour, that will receive asphalt mixtures from the hauling equipment,
 - 2. Storage bin with a minimum capacity of 14 tons of asphalt mixture,
 - 3. An auger system in the storage bin to continuously blend the asphalt mixture prior to discharge to the conveyor system: and
 - 4. A discharge conveyor, with the ability to swivel, to deliver the mixture to the paving spreader.
- D. Paving Equipment – Asphalt pavers shall conform to Section 400.3.02 of the GDOT Standard Specifications.
- E. Compaction Equipment – Rollers shall conform to Section 400.3.02 of the GDOT Standard Specifications.
- F. Preparation of the asphalt binder material (asphalt cement):
 - 1. The binder shall be stored within the temperature range specified by the supplier of the binder for the grade of asphalt cement being used. Different grades of asphalt binder (cement) shall be stored separately and not mixed together at any time.
 - 2. The binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature.

3. The temperature of the binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 350 degrees F unless otherwise required by the asphalt binder (cement) manufacturer.

G. Preparation of aggregates:

1. The aggregate for the mixture shall be heated and dried prior to introduction into the mixer. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates.
2. The aggregate temperature shall not be lower than is required to obtain complete coating and uniform distribution of the aggregate particles and to provide a mixture of satisfactory workability.

H. Preparation of bituminous mixture:

1. The aggregates and the bituminous material shall be properly proportioned and introduced into the mixer in the amount specified by the job mix formula.
2. The moisture content of all bituminous mix upon discharge shall not exceed 1.0 percent.

I. Preparation of the underlying surface:

1. Asphalt materials shall not be placed until the underlying course has been tested by the Contractor and accepted by Chatham County.
2. Immediately before placing asphalt materials, clean all underlying pavement surfaces and previous courses of all loose and foreign material by sweeping with hand brooms, power sweepers or blowers as directed by Chatham County.
3. Tack coat:
 - a. Apply tack coat only when the underlying surface is dry, and the ambient temperature meets the requirements for the pavement course being placed as described in Paragraph 1.6.A (1).
 - b. Tack coat shall be applied in accordance with Section 413 of the GDOT Standard Specifications, except the residual asphalt coating shall be 0.03 to 0.05 gallons per square yard on newly placed asphalt surfaces.
4. Manholes, valve boxes, inlets, and other appurtenances within the area to be paved shall be adjusted to grade as shown on the drawings.

J. Transporting, placing, and finishing:

1. The asphalt concrete mixture shall be transported from the mixing plant to the site in vehicles conforming to the requirements specified herein.
2. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to atmospheric temperature.
3. Compacted asphalt concrete lift thickness shall be equal to or greater than 3 times the nominal maximum aggregate size, but not more than 4 inches, unless approved by Chatham County.

4. The initial placement of the asphalt concrete mixture shall occur at a temperature suitable for obtaining density, surface smoothness, and other specified requirements but not less than 250 degrees F, unless approved by Chatham County.
5. Upon arrival, the mixture shall be placed to the full width of the paving lane. It shall be struck off in a uniform layer of such depth that, when the mix is properly compacted, shall have the required thickness and conform to the grade and contour indicated. The speed of the paver shall be regulated to eliminate pulling and tearing of the bituminous mat. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 10 feet except where edge lanes require less width to complete the area.
6. Joints:
 - a. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 6 inches; however, the joint in the surface course shall be at the centerline of the pavement if that pavement is to be used by normal car or truck traffic.
 - b. Transverse joints in one course shall be offset by at least 10 feet longitudinally from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet.
7. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and raked by hand tools.

K. Compaction of mixture:

1. After placing, the mixture shall be thoroughly and uniformly compacted by rolling. The surface shall be compacted as soon as possible when the mixture has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor.
2. Compaction shall be completed before the mixture cools below 175 degrees F, unless otherwise approved by Chatham County. Temperature shall be determined using an infrared thermometer.
3. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once.
4. In areas not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers.
5. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching will not be allowed.

L. Joints:

1. The formation of all joints shall be made in such a manner as to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.
2. The roller shall not pass over the unprotected transverse end of the freshly laid mixture except when necessary to form a temporary stop. After a temporary stop and prior to the continuation of paving, the tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face before placing the adjacent lane.
3. Longitudinal joints which are irregular, damaged, uncompacted, or otherwise defective shall be cut back to expose a clean, vertical sound surface for the full depth of the course. Apply tack coat on all newly exposed contact surfaces before placing any fresh mixture against the joint.

3.2 Corrections of deficiencies:

A. Deficiencies in asphalt mixture properties, mat density or joint density:

1. The Contractor may be directed by Chatham County to remove and replace the lot or subplot in question at no additional cost to Chatham County.

B. Deficiencies in layer thickness:

1. The Contractor may be directed by Chatham County to remove and replace the lot or subplot in question at no additional cost to Chatham County.

C. Deficiencies in final surface smoothness and finish grade tolerance:

1. In the event surface smoothness and/or surface grades fail to comply with the specifications, make corrections as specified below at no additional cost to Chatham County.
2. The area of deficiencies in surface smoothness and/or surface grade tolerance shall be defined as the area enclosed by a line of points half way between the grade in excess of the specified tolerance and the next finished grade shown on the contract drawings that meets the specified tolerance, both longitudinally and transversely.
3. Replace pavement deficient in final surface smoothness and/or final surface grade tolerance requirements or, at the option of Chatham County, add overlays where required to correct deficiencies in accordance with all applicable requirements of the contract drawings and this section, at times approved by Chatham County, so as not to interfere with operations of Chatham County or others using the area. A minimum thickness of 2 inches shall be placed as an overlay. Existing pavement shall be removed as necessary to provide square joints for the full depth of the overlay.
4. Where the deficiency in surface grade tolerance is in excess of ½ inch above or below the grade shown on the contract drawings but where a contour pattern satisfying riding quality and drainage as shown on the contract drawings has been established to the satisfaction of Chatham County, pavement may be left in place.

- D. All deficiencies identified by surveys conducted in accordance with Paragraph 1.3 shall be corrected prior to placement of the top course. Submit detailed paving plan to Chatham County a minimum of 3 days prior to planned installation of the top course to address proposed corrective measures.

End of Section 02745

SECTION 02763

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

This work shall include furnishing and applying traffic line paint according to the Construction Drawings and these Specifications.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

GEORGIA DEPARTMENT OF TRANSPORTATION (GDOT)

GDOT (2001) State of Georgia: Standard Specification for Construction of Transportation Systems

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01300, "Submittals."

1.3.1. Product Data

A. Composition Requirements

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

1.3.2. Test Reports

A. Sampling and Testing

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

1.4 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.5 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition.

1.5.1 Paint Application Equipment

1.5.1.1 Self-Propelled or Mobile-Drawn Pneumatic Spraying Machines

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION, and of even uniform thickness with clear-cut edges. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

1.5.1.2 Hand-Operated, Push-Type Machines

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

1.5.2 Surface Preparation Equipment

1.5.2.1 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 150 cfm of air at a pressure of not less than 90 psi at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

1.5.3 Marking Removal Equipment

Equipment shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

1.5.4 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

1.6 MAINTENANCE OF TRAFFIC

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

1.7 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 40 degrees F and rising at the beginning of operations, except those involving sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

PART 2 - PRODUCTS

2.1 PAINT

2.1.1 Material shall be in accordance with GDOT Sections 652 and 870 of the Standard Specifications.

2.1.2 The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards.

2.1.3 Color: Paint shall conform to the following colors specified in the GDOT Standard Specification Section 870.

A. No. 5A, Waterborne White Traffic Line Paint: See Construction Drawings for locations.

B. No. 5B, Waterborne Yellow Traffic Line Paint: See Construction Drawings for locations.

2.2 THERMOPLASTIC PAVEMENT MARKINGS

2.2.1 Material shall be in accordance with GDOT Sections 652, 653 and 870 of the Standard Specifications.

2.2.2 Color: Shall conform to the following colors specified in the drawings and per GDOT Standard Specification Section 653 Paragraph 2.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

3.1.1 Pretreatment for Early Painting

Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

3.1.2 Cleaning Existing Pavement Markings

In general, markings shall not be placed over existing pavement marking patterns. Existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns, shall be removed. Deteriorated or obscured markings that are not misleading or confusing or interfere with the adhesion of the new marking material do not require removal. Whenever grinding, scraping, sandblasting or other operations are performed the work must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces shall be allowed to cure for a period of not less than 7 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.1.1 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.3 MARKING REMOVAL

Pavement marking shall be removed in the areas shown on the drawings. Removal of marking shall be as complete as possible without damage to the surface. Aggregate shall not be exposed by the removal process. After the markings are removed, the cleaned pavement surfaces shall exhibit adequate texture for remarking as specified in paragraph SURFACE PREPARATION.

3.3.1 Equipment Operation

Equipment shall be controlled and operated to remove markings from the pavement surface, prevent dilution or removal of binder from underlying pavement, and prevent emission of blue smoke from asphalt or tar surfaces.

3.3.2 Cleanup and Waste Disposal

The worksite shall be kept clean of debris and waste from the removal operations. Cleanup shall immediately follow removal operations in areas subject to air traffic. Debris shall be disposed of at approved sites.

End of Section 02763

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

Work under this section includes requirements for materials, mixing, forming, placing, finishing, and curing reinforced cast-in-place concrete for all structural members. The Contractor shall provide all labor, materials, equipment, and incidental items necessary to provide all cast-in-place concrete indicated on the project drawings and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(1990; R 2002) Standard Tolerances for Concrete Construction and Materials & Commentary
ACI 211.1	(1991; R 2002) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	(1999) Specifications for Structural Concrete for Buildings
ACI 302.1R	(2004) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(1996) Placing Concrete by Pumping Methods
ACI 304R	(2000) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(1999) Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 318M/318RM	(2002) Metric Building Code Requirements for Structural Concrete and Commentary
ACI 347R	(2003) Guide to Formwork for Concrete
ACI SP-66	(2004) ACI Detailing Manual

**AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)**

AASHTO M 182	(1991; R 2000) Burlap Cloth Made from Jute or Kenaf
AASHTO T 259	(2002) Standard Method of Test for Resistance of Concrete to Chloride Ion Penetration

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995) Basic Hardboard
ASTM INTERNATIONAL (ASTM)	
ASTM A 185	(2002) Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 496	(2002) Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 497	(2002) Steel Welded Wire Reinforcement, Deformed, for Concrete
ASTM A 615/A 615M	(2004b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 617/A 617M	(1996a) Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 82	(2002) Steel Wire, Plain, for Concrete Reinforcement
ASTM C 1017/C 1017M	(2003) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1107	(2002) Packaged Dry, Hydraulic-Cement Grout(Nonshrink)
ASTM C 143/C 143M	(2003) Slump of Hydraulic Cement Concrete
ASTM C 150	(2004a) Portland Cement
ASTM C 171	(2003) Sheet Materials for Curing Concrete
ASTM C 172	(2004) Sampling Freshly Mixed Concrete
ASTM C 173/C 173M	(2001e1) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192/C 192M	(2002) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 227	(2003) Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
ASTM C 231	(2004) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(2001) Air-Entraining Admixtures for Concrete
ASTM C 295	(2003) Petrographic Examination of Aggregates for Concrete
ASTM C 309	(2003) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2003a) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(2003) Concrete Aggregates

ASTM C 39	(1993a) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(2004) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 494/C 494M	(2004) Chemical Admixtures for Concrete
ASTM C 618	(2003) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 920	(2002) Elastomeric Joint Sealants
ASTM C 94/C 94M	(2004a) Ready-Mixed Concrete
ASTM C 989	(2004) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM D 1190	(1997) Concrete Joint Sealer, Hot-Applied Elastic Type
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

U.S. DEPARTMENT OF COMMERCE (DOC)

PS1	(1995) Construction and Industrial Plywood (APA V995)
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1.3 DEFINITIONS

- A. "Cementitious material" as used herein shall include all portland cement, pozzolan, fly ash, and ground iron blast-furnace slag.
- B. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01300, "Submittals."

1.4.1 Shop Drawings

A. Reinforcing steel

Reproductions of contract drawings are unacceptable. ACI SP-66. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.

1.4.2 Product Data

- A. Materials for curing concrete
- B. Epoxy bonding compound

1.4.3 Design Data

- A. Concrete mix design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, ground slag, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. No material shall be provided unless proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by Chatham County. The submittal shall clearly indicate where each mix design will be used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregate changes. In addition, copies of the fly ash, and pozzolan test results shall be submitted. The approval of fly ash, and pozzolan test results shall have been within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

1.4.4 Test Reports

- A. Concrete mix design

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports shall include mill test and all other test for cement, aggregates, and admixtures. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Test reports shall be submitted along with the concrete mix design. Obtain approval prior to concrete placement.

- B. Fly ash

Submit test results in accordance with ASTM C 618 for fly ash.

- C. Aggregates

ASTM C 227 for potential alkali-silica reactions, ASTM C 295 for petrographic analysis.

- D. Compressive strength tests

1.4.5 Certificates

- A. Testing

Qualifications of the independent testing laboratory for approval.

1.5 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may," wherever they appear. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Chatham County.

1.6 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI 301 for job site storage of materials. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed.

1.6.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

PART 2 - PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Plywood: PS1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining. Steel form surfaces shall not contain irregularities, dents, or sags.

2.2 FORM TIES AND ACCESSORIES

The use of wire alone is prohibited. Form ties and accessories shall not reduce the effective cover of the reinforcement.

2.3 CONCRETE

2.3.1 Contractor-Furnished Mix Design

ACI 211.1, ACI 301, and ACI 318M/318RM except as otherwise specified. The compressive strength (f_c) of the concrete for each portion of the structure(s) shall be as indicated and as specified below.

Location	f_c (Min. 28 Day Comp. Strength) (psi)	ASTM C 33 Maximum Nominal Aggregate (Size No.)	Range of Slump (inches)	Maximum Water- Cement Ratio (by weight)	Air Entr. (percent)	Minimum Cementitious Material (lb/cy)	Minimum Portland Cement (lb/cy)
All areas	5,000	57	4 to 5	0.40	6.0	675	505

Maximum slump shown above may be increased 1 inch for methods of consolidation other than vibration. Slump may be increased to 8 inches when super-plasticizers are used. Provide air entrainment using air-entraining admixture. Air entrainment shall be within plus or minus 1.5 percent of the value specified.

2.3.1.1 Mix Proportions for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test report indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1. The trial mixture shall use at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratio required will be based on equivalent water-cement ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan, and ground granulated blast-furnace slag by weight equivalency method. Laboratory trial mixture shall be designed for maximum permitted slump and air content. Each combination of material proposed for use shall have separate trial mixture, except for accelerator or retarder use can be provided without separate trial mixture. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39 for 7 and 28 days. From these results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition a curve shall be plotted showing the relationship between 7 and 28 day strengths.

2.3.1.2 Required Average Strength of Mix Design

The selected mixture shall produce an average compressive strength exceeding the specified strength by the amount indicated in ACI 301. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation shall be calculated and the required average compressive strength shall be determined in accordance with ACI 301. When a concrete production facility does not have a suitable record of tests to establish a standard deviation, the required average strength shall be as 6,200 psi:

2.4 MATERIALS

2.4.1 Cement

ASTM C 150, Type II or ASTM C 595/C595M, Type IP(MS).

2.4.1.1 Fly Ash and Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum allowable loss on ignition shall be 6 percent for Types N and F. Add with cement.

2.4.1.2 Ground Iron Blast-Furnace Slag

ASTM C 989, Grade 120.

2.4.2 Water

Water shall be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

2.4.3 Aggregates

ASTM C 33, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement.

2.4.4 Nonshrink Grout

Grout should be in accordance with ASTM C 1107. For all non-shrink grout, provide high strength non-shrink grout manufactured by Five Star or an owner approved equal.

2.4.5 Admixtures

2.4.5.1 Air-Entraining

ASTM C 260

2.4.5.2 Accelerating

ASTM C 494, Type C

2.4.5.3 Retarding

ASTM C 494, Type B, D, or G

2.4.5.4 Water Reducing

ASTM C 494, Type A, E, or F

2.4.5.5 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C 494, Type F and ASTM C 1017

2.4.5.6 Calcium Nitrite Corrosion Inhibitor

ASTM C 494, Type C

Calcium Nitrite Corrosion Inhibitor shall be added to the concrete mix. The admixture shall consist of a Corrosion Inhibitor at a rate of 3.5 gallons per cubic yard. Any air-entraining, water-reducing, and/or set-controlling admixtures used in the production of concrete mixtures for concrete shall be compatible with calcium nitrite solutions.

The Contractor shall strictly adhere to the manufacturer's written recommendations regarding the use of the admixture including storage, transportation, and method of mixing. The calcium nitrite, which acts as an accelerator, may be used in conjunction with the retarder to control the set of concrete, as per manufacturer's recommendation.

2.4.5.7 Anti-Washout Admixture

When concrete will be cast in water, provide V-MAR 3 anti-washout admixture manufactured by Grace Construction Product or an owner approved equal. Provide an anti-washout admixture dosage to achieve a maximum 5% loss of weight. Calcium chloride shall not be used as an admixture.

2.4.6 Materials for Curing Concrete

2.4.6.1 Impervious Sheeting

ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.4.6.2 Pervious Sheeting

AASHTO M 182.

2.4.6.3 Liquid Membrane-Forming Compound

ASTM C 309, white-pigmented, Type 2, Class B.

2.4.7 Liquid Chemical Sealer-Hardener Compound

Compound shall be magnesium fluosilicate which when mixed with water seals and hardens the surface of the concrete. Do not use on exterior slabs exposed to freezing conditions. Compound shall not reduce the adhesion of waterproofing, or other material applied to concrete.

2.4.8 Epoxy Bonding Compound

ASTM C 881. Provide Type I for bonding hardened concrete to hardened concrete and Type II for bonding freshly mixed concrete to hardened concrete. Provide Grade 1 or 2 for horizontal surfaces and Grade 3 for vertical surfaces. Provide Class A if placement temperature is below 40 degrees F; Class B if placement temperature is between 40 and 60 degrees F; or Class C if placement temperature is above 60 degrees F.

2.5 REINFORCEMENT

2.5.1 Reinforcing Bars

ACI 301 unless otherwise specified. ASTM A 615/A 615M and ASTM A 617/A 617M with the bars marked A, S, W, Grade

2.5.2 Mechanical Reinforcing Bar Connectors

ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.

2.5.3 Wire

ASTM A 82 or ASTM A 496.

2.5.4 Reinforcing Bar Supports

Provide bar ties and supports of coated or non corrodible material.

PART 3 - EXECUTION

3.1 FORMS

ACI 301. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris. Forms submerged in water shall be watertight.

3.1.1 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

3.1.2 Removal of Forms and Supports

After placing concrete, forms shall remain in place for the time periods specified in ACI 347R. Prevent concrete damage during form removal.

3.1.2.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C 39 test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a minimum of 85 percent of the design strength.

3.1.3 Reshoring

Reshore concrete elements where forms are removed prior to the specified time period. Do not permit elements to deflect or accept loads during form stripping or reshoring. Forms on walls, or other load-bearing members may be stripped after 2 days if loads are not applied to the members. After forms are removed, slabs and beams over 10 feet in span and cantilevers over 4 feet shall be reshored for the remainder of the specified time period in accordance with paragraph entitled "Removal of Forms." Perform reshoring operations to prevent subjecting concrete members to overloads, eccentric loading, or reverse bending. Reshoring elements shall have the same load-carrying capabilities as original shoring and shall be spaced similar to original shoring. Firmly secure and brace reshoring elements to provide solid bearing and support.

3.3 FORMED SURFACES

3.3.1 Tolerances

ACI 347R and as indicated.

3.3.2 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used.

3.4 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI 301. Provide bars, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement shall not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.4.1 Reinforcement Supports

Place reinforcement and secure with galvanized or non corrodible chairs, spacers, or metal hangers. For supporting reinforcement on the ground, use concrete or other non corrodible material, having a compressive strength equal to or greater than the concrete being placed.

3.4.2 Splicing

As indicated. For splices not indicated ACI 301. Do not splice at points of maximum stress.

3.4.3 Cover

ACI 301 for minimum coverage, unless otherwise indicated.

3.4.4 Construction Joints

Locate joints to least impair strength. Location of construction joints shall be approved by Chatham County. Continue reinforcement across joints unless otherwise indicated.

3.5 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C 94/C 94M, ACI 301, ACI 302.1R, and ACI 304R, except as modified herein. Batching equipment shall be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.5.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

3.5.2 Mixing

ASTM C 94/C 94M and ACI 301. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.5.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.6 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

3.6.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by Chatham County. Excavation width shall be a minimum of 4 inches greater than indicated.

3.6.2 Vibration

ACI 301 Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4 inches or less in depth by wood tampers, spading, and settling with a heavy leveling straightedge. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Insert and withdraw vibrators approximately 18 inches apart. Penetrate the previously placed lift with the vibrator when more than one lift is required. Place concrete in 18 inch maximum vertical lifts. External vibrators shall be used on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

3.6.3 Application of Epoxy Bonding Compound

Apply a thin coat of compound to dry, clean surfaces. Scrub compound into the surface with a stiff-bristle brush. Place concrete while compound is stringy. Do not permit compound to harden prior to concrete placement. Follow manufacturer's instructions regarding safety and health precautions when working with epoxy resins.

3.6.4 Pumping

ACI 304R and ACI 304.2R. Pumping shall not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy. Rapid changes in pipe sizes shall be avoided. Maximum size of course aggregate shall be limited to 33 percent of the diameter of the pipe. Maximum size of well rounded aggregate shall be limited to 40 percent of the pipe diameter. Samples for testing shall be taken at both the point of delivery to the pump and at the discharge end.

3.6.5 Cold Weather

ACI 306.1. Do not allow concrete temperature to decrease below 50 degrees F Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 5 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.6.6 Hot Weather

ACI 305R. Maintain required concrete temperature using Figure 2.1.5 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.7 SURFACE FINISHES

3.7.1 Defects

Repair formed surfaces by removing minor honeycombs, pits greater than 1 square inch surface area or 0.25 inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects which affect the serviceability or structural strength will be rejected, unless correction of defects is approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347R. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise specified.

3.7.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified shall be finished with wood floats to even surfaces. Finish shall match adjacent finishes.

3.7.3 Formed Surfaces

3.7.3.1 Tolerances

ACI 117 and as indicated.

3.7.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view. Patch holes and defects and level abrupt irregularities. Remove or rub off fins and other projections exceeding 0.25 inch in height.

3.8 FLOOR AND SLAB FINISHES AND MISCELLANEOUS CONSTRUCTION

ACI 302.1R, unless otherwise specified.

3.8.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.8.1.1 Floated

Use for exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float shall begin when the surface has stiffened sufficiently to permit the operation. During or after the first floating, surface shall be checked with a 10 foot straightedge applied at no less than two different angles, one of which is perpendicular to the direction of strike off. High spots shall be cut down and low spots filled during this procedure to produce a surface level within 1/4 inch in 10 feet.

3.9 CURING AND PROTECTION

ACI 301 unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer-hardener or epoxy coating.

3.9.1 Moist Curing

Remove water without erosion or damage to the structure.

3.9.1.1 Ponding or Immersion

Continually immerse the concrete throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.9.1.2 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.9.1.3 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.9.1.4 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.9.2 Liquid Membrane-Forming Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

3.9.2.1 Application

Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Re-spray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

3.9.2.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

3.9.3 Liquid Chemical Sealer-Hardener

Apply sealer-hardener to interior floors not receiving floor covering and floors located under access flooring. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. The sealer-hardener shall not be applied until the concrete has been moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

3.9.4 Curing Periods

ACI 301, 21 days for concrete that will be in full-time or intermittent contact with seawater, salt spray, alkali soil or waters. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval by Chatham County.

3.10 FIELD QUALITY CONTROL

3.10.1 Sampling

ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31/C 31M for making test specimens.

3.10.2 Testing

Testing shall be performed by an approved independent testing laboratory subject to approval.

3.10.2.1 Slump Tests

ASTM C 143/C 143M. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.10.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.10.2.3 Compressive Strength Tests

ASTM C 39. Make five test cylinders for each set of tests in accordance with ASTM C 31/C 31M. Precautions shall be taken to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Samples for strength tests of each mix design of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cubic yards of concrete. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result shall be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than f'_c or if any strength test result falls below f'_c by more than 500 psi, take a minimum of three ASTM C 42/C 42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test shall be considered structurally adequate if the average of three cores is equal to at least 85 percent of f'_c and if no single core is less than 75 percent of f'_c . Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.10.2.4 Air Content

ASTM C 173/C 173M or ASTM C 231 for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

End of Section 03300

SECTION 03410

PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

Work under this section includes requirements for materials, mixing, forming, placing, finishing, and curing precast concrete for all structures, including but not limited to: drainage structures, drop inlets, utility vaults, etc. The Contractor shall provide all labor, materials, equipment, and incidental items necessary to provide all precast concrete indicated on the project drawings and as specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 304R(2000)	Measuring, Mixing, Transporting, and Placing Concrete
ACI 309R(1996)	Consolidation of Concrete
ACI 318/318R(2002)	Building Code Requirements for Structural Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 27/A 27M(2003)	Steel Castings, Carbon, for General Application
ASTM A 47/ A 47M(1999)	Ferritic Malleable Iron Castings
ASTM A 82(1997)	Steel Wire, Plain, for Concrete Reinforcement
ASTM A 123/A 123M(2002)	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M(2003)	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 496(2002)	Steel Wire, Deformed, for Concrete Reinforcement
ASTM A 615/A 615M(2004)	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 780(2001)	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM C 33(2003)	Concrete Aggregates
ASTM C 94/ C 94M (2003; Rev. A)	Ready-Mixed Concrete
ASTM C 150 (2002; E2003 Rev. A)	Portland Cement
ASTM C 260(2001)	Air-Entraining Admixtures for Concrete

ASTM C 494
(1999; E2001 Rev. A)

Chemical Admixtures for Concrete

ASTM C 1107(2002)

Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

ASTM C 1260(2001)

Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4(1998)

Structural Welding Code - Reinforcing Steel

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116(1999)

Quality Control for Plants and Production of Precast Prestressed Concrete Products

PCI MNL-120(1999)

Design Handbook - Precast and Prestressed Concrete

1.3 SYSTEM DESCRIPTION

The work includes the provision of precast non-prestressed concrete herein referred to as precast structures. Precast structures shall be the product of a manufacturer specializing in the production of precast concrete structures.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01300, "Submittals."

A. Shop Drawings

1. Drawings of precast structures

B. Design Data

1. Concrete mix design

C. Test Reports

1. Concrete mix design

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports shall include mill test and all other test for cement, aggregates, and admixtures. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Test reports shall be submitted along with the concrete mix design. Obtain approval before concrete placement.

2. Aggregates

Submit test results for aggregates in accordance with ASTM C 1260 for potential alkali-silica reactions.

3. Compressive Strength tests

D. Certificates

1. Quality control procedures

Submit quality control procedures established in accordance with PCI MNL-116 by the precast manufacturer.

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Manufacturer Qualifications

PCI MNL-116. Plants shall be certified by the PCI Plant Certification Program. At Chatham County's option, PCI Plant quality control program records shall be available for review.

1.5.2 Regulatory Requirements

Provide precast structures in conformance with ACI 318/318R and AWS D1.4.

1.5.3 Concrete Mix Design

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, ground slag, and admixtures, and applicable reference specification. Provide mix proportion data using at least three different water-cement ratios for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. No material shall be provided unless proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by Chatham County. The submittal shall clearly indicate where each mix design will be used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregates changes.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Transportation

1.6.1.1 Transporting Structures

In transporting structures by truck, railroad car, or barge, provision shall be made for supporting the structures as described above, except battens can be continuous over more than one stack of units, with adequate bracing to ensure their maintaining the vertical position and damping of dangerous vibrations. Trucks with double bolsters are satisfactory provided the structures are fully seated on the outer bolsters at not more than 3 feet or the depth of the member from the end and the inner bolster is not more than 8 feet from the end of the member or the designated pickup point. Adequate padding material shall be provided between tie chains or cables to preclude chipping of concrete.

1.6.2 Storage

1.6.2.1 Storage Areas

Storage areas for precast structures shall be stabilized, and suitable foundations shall be provided, so differential settlement or twisting of structures will not occur.

1.6.3 Handling of Structures

The location of pickup points for handling of the structures and details of the pickup devices shall be shown in shop drawings. Structures shall be handled only by means of approved devices at designated locations. Structures shall be maintained in an upright position at all times and picked up and supported as shown in approved shop drawings.

PART 2 - PRODUCTS

2.1 CONTRACTOR-FURNISHED MIX DESIGN

ACI 318/318R. The minimum compressive strength of concrete at 28 days shall be 5000 psi. The maximum water cement ratio shall be 0.40.

2.2 MATERIALS

2.2.1 Cement

ASTM C 150, Type II

2.2.2 Water

Water shall be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete, ACI 318/318R.

2.2.3 Aggregates

2.2.3.1 Aggregates Selection

ASTM C 33, Size 57. Obtain aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement, nor in an amount sufficient to cause excessive expansion of concrete. Prior to fabrication, submit certified test reports for the following tests specified in ASTM C 33

2.2.3.2 Alkali-Silica Reactivity

Evaluate and test fine and coarse aggregates to be used in all concrete for alkali-aggregate reactivity in accordance with ASTM C 1260. Test both coarse aggregate size groups if from different sources.

2.2.4 Grout

2.2.4.1 Nonshrink Grout

ASTM C 1107.

2.2.4.2 Cementitious Grout

Shall be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method.

2.2.5 Admixtures

2.2.5.1 Air-Entraining

ASTM C 260.

2.2.5.2 Accelerating

ASTM C 494/ C 494M, Type C or E.

2.2.5.3 Water Reducing

ASTM C 494/ C 494M, Type A, E, or F.

2.2.5.4 Calcium Nitrite Corrosion Inhibitor

Calcium Nitrite Corrosion Inhibitor shall be added to the concrete mix. The admixture shall consist of a Corrosion Inhibitor at a rate of 3.5 gallons per cubic yard. Any air-entraining, water-reducing, and/or set-controlling admixtures used in the production of concrete mixtures for concrete shall be compatible with calcium nitrite solutions.

The Contractor shall strictly adhere to the manufacturer's written recommendations regarding the use of the admixture including storage, transportation, and method of mixing. The calcium nitrite, which acts as an accelerator, may be used in conjunction with the retarder to control the set of concrete, as per manufacturer's recommendation.

2.2.6 Reinforcement

2.2.6.1 Reinforcing Bars

ASTM A 615/A 615M, Grade 60

2.2.6.2 Wire

ASTM A 82 or ASTM A 496.

2.2.7 Metal Accessories

Provide ASTM A 123/A 123M or ASTM A 153/A 153M galvanized.

2.2.7.1 Inserts

ASTM A 47/ A 47M, Grade 32510 or 35018, or ASTM A 27/A 27M Grade U-60-30.

2.3 PRODUCTION QUALITY CONTROL PROCEDURES

PCI MNL-116 unless specified otherwise.

2.3.1 Forms

Brace forms to prevent deformation. Forms shall produce a smooth, dense surface. Chamfer exposed edges of columns and beams 3/4 inch, unless otherwise indicated. Provide threaded or snap-off type form ties.

2.3.2 Reinforcement Placement

ACI 318/318R for placement and splicing. Reinforcement may be preassembled before placement in forms. Provide exposed connecting bars, or other approved connection methods, between precast and cast-in-place construction. Remove any excess mortar that adheres to the exposed connections.

2.3.3 Concrete

2.3.3.1 Concrete Mixing

ASTM C 94/ C 94M. Mixing operations shall produce batch-to-batch uniformity of strength, consistency, and appearance.

2.3.3.2 Concrete Placing

ACI 304R and ACI 309R, unless otherwise specified.

2.3.3.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing. Provide curing procedures to keep the temperature of the concrete between 50 and 190 degrees F. When accelerated curing is used, apply heat at controlled rate and uniformly along the casting beds. Monitor temperatures at various points in a product line in different casts.

2.3.4 Surface Finish

Repairs located in a bearing area shall be approved by Chatham County prior to repairs. Precast structures containing hairline cracks which are visible and are less than 0.01 inches in width, may be accepted, except that cracks larger than 0.005 inches in width for surfaces exposed to the weather shall be repaired. Defects that involve more than 36 square inches of concrete shall be grounds for rejection. Any precast member that is structurally impaired or contains honeycombed section deep enough to expose stressing tendons or reinforcing shall be rejected. Defects shall be repaired or rejected as specified in paragraph "Defects."

2.3.4.1 Unformed Surfaces

Provide a steel troweled finish.

2.3.4.2 Formed Surfaces

PCI MNL-116 (Appendix A - Commentary), Chapter 3, for grades of surface finishes.

a. Unexposed Surfaces: Provide a standard grade surface finish.

b. Exposed Surfaces: Provide a standard grade surface finish

2.3.5 Acceptance/Rejection of Defects

2.3.5.1 Minor Defects

All honeycombed areas, chipped corners, air pockets over 1/4 inch in diameter, and other minor defects involve less than 36 square inches of concrete shall be repaired. Form offsets of fins over 1/8 inch shall be ground smooth. All unsound concrete shall be removed from defective areas prior to repairing. All surfaces permanently exposed to view shall be repaired by a blend of portland cement and white cement properly proportioned so that the final color when cured will be the same as adjacent concrete.

2.3.5.2 Major Defects

Major defects are those which involve more than 36 square inches of concrete or expose stressing tendons or reinforcing steel. If one or more major defects appear in a member, it shall be rejected. Cracks of a width of more than 0.01 inch shall be cause for rejection of the member.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

2.4.1 Factory Inspection

At the option of Chatham County, precast units may be inspected by Chatham County prior to being transported to the job site. The Contractor shall give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect Chatham County's right to enforce contractual provisions after units are transported or erected.

PART 3 - EXECUTION

3.1 EXAMINATION

Prior to erection, and again after installation, precast structures shall be checked for damage, such as cracking, spalling, and honeycombing. As directed by Chatham County structures that do not meet the surface finish requirements specified in Part 2 in paragraph entitled "Surface Finish" shall be repaired, or removed and replaced with new precast structures.

3.2 ERECTION

Precast structures shall be erected after the concrete has attained the specified compressive strength, unless otherwise approved by the precast manufacturer. Erect in accordance with the approved shop drawings. PCI MNL-116 and PCI MNL-120 (Chapter 8), for tolerances. Provide a 1:500 tolerance, if no tolerance is specified. Brace precast structures, unless design calculations submitted with the shop drawings indicate bracing is not required. Follow the manufacturer's recommendations for maximum construction loads. Place precast structures level, plumb, square, and true within tolerances. Align member ends.

3.3 BEARING SURFACES

Shall be flat, free of irregularities, and properly sized. Size bearing surfaces to provide for the indicated clearances between the precast structures and adjoining field placed surfaces.

3.4 ANCHORAGE

Provide anchorage for fastening work in place. Conceal fasteners where practicable. Make threaded connections up tight and nick threads to prevent loosening.

3.5 OPENINGS

Holes or cuts requiring reinforcing to be cut, which are not indicated on the approved shop drawing, shall only be made with the approval of the Engineer and the precast manufacturer. Drill holes less than 12 inches in diameter with a diamond tipped core drill.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A 780 zinc rich paint for galvanized surfaces damaged by handling, transporting, cutting, welding, bolting, or acid washing. Do not heat surfaces to which repair paint has been applied.

End of Section 03410

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

Work under this section consists in general of furnishing all labor, materials, tools, equipment, and incidentals to provide all metal fabrications including, but not limited to pile connection angles, guardrails, handrails and tie-back system components as indicated on the Construction Drawings and specified herein.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2000) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2008) Structural Welding Code – Steel

AWS D1.2/D1.2M (2008) Structural Welding Code – Aluminum

ASME INTERNATIONAL (ASME)

ASME B18.22.1 (1965; R 2003) Plain Washers

ASTM INTERNATIONAL (ASTM)

ASTM A 108 (2003) Standard Specification for Steel Bar, Carbon, and Alloy Cold Finished

ASTM A 123/A 123M (2002) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153/A 153M (2004) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 276 (2006) Standard Specification for Stainless Steel Bars and Shapes

ASTM A 325 (2006) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 53 (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 449	(2007b) Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A 500	(2003a) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 514	(2000a) High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM A 572	(2006) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 563	(2004a) Carbon and Alloy Steel Nuts
ASTM A 653/A 653M	(2009) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 666	(1996) Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM A 780	(2001) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM A 992/A 992M	(2006a) Standard Specification for Structural Steel Shapes
ASTM B 209	(2004) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2004a) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D 1187	(1997; R 2002e1) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM E 488	(1996; R 2003) Strength of Anchors in Concrete and Masonry Elements
ASTM F 593	(1998) Stainless Steel Bolts, Hex Cap Screws, and Studs

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-664	(Rev D) Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant
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1.3 SUBMITTALS

Submit the following in accordance with Section 01300, "Submittals."

A. Shop Drawings

1. Pile Connection Angles, fabrication drawings
2. Handrails, fabrication drawings

3. Guardrails, fabrication and installation drawings
4. Anchoring System, fabrication and installation drawings

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation details.

1.4 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M for welding steel and AWS D1.2/D1.2M for welding aluminum. Use procedures, materials, and equipment of the type required for the work.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A 992/A 992M or ASTM A 572/A 572M Grade 50.

2.1.2 Aluminum Pipe and Plates

T6061-T6 Aluminum and in conformance with ASTM B 209, ASTM B 221 and ASTM B 308/308M.

2.1.4 Handrail Anchor Bolts

Provide Type 316 stainless steel anchor bolts, washers and nuts

2.1.5 Bolts, and Nuts

ASTM A325 (Galvanized Bolts), ASTM A563 (Galvanized Nuts)

2.1.6 Washers

Provide plain galvanized or stainless steel washers to conform to ASME B18.22.1.

2.2 COATING

2.2.1 Aluminum

Aluminum shall not be coated

2.2.2 Steel

Steel members that shall be embedded in concrete shall be coated with two coats of coal tar epoxy after fabrication. Each coat shall have an 8 mil dry film thickness. Prepare steel and coat per the manufacturer's instructions.

2.2.3 Repair of Galvanized Surfaces

Repair damaged galvanized surfaces with 2 coats of a brush on type galvanizing repair compound which is in conformance with ASTM A 780 and approved by the Owner. Let first coat dry per the manufacturer's instructions prior to applying the second coat. Spray on type galvanizing repair compounds are not acceptable.

2.3 Manhole Covers

Manhole covers shall be in accordance with Georgia Department of Transportation Standards.

2.4 Guardrails

Guardrails shall be in accordance with Georgia Department of Transportation Standards.

PART 3 – EXECUTION

3.1 INSTALLATION

Install items at locations indicated, according to manufacturer's instructions. Items listed below require additional procedures.

3.2 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.3 FINISHES

3.3.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to FS TT-P-664 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D 1187, asphalt-base emulsion.

3.3.2 Environmental Conditions

Do not clean or field paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Owner.

3.4 UTILITY VAULT COVERS & FRAMES

Install the tops of cover plates and frames flush with concrete.

*** End of Section 05500 ***

ATTACHMENT A

DRUG - FREE WORKPLACE CERTIFICATION

THE UNDERSIGNED CERTIFIES THAT THE PROVISIONS OF CODE SECTIONS 50-24-1 THROUGH 50-24-6 OF THE OFFICIAL CODE TO GEORGIA ANNOTATED, RELATED TO THE **DRUG-FREE WORKPLACE**, HAVE BEEN COMPLIED WITH IN FULL. THE UNDERSIGNED FURTHER CERTIFIES THAT:

1. A Drug-Free Workplace will be provided for the employees during the performance of the contract; and
2. Each sub-contractor under the direction of the Contractor shall secure the following written certification:

_____ (CONTRACTOR) certifies to Chatham County that a Drug-Free Workplace will be provided for the employees during the performance of this contract known as **Laroche Avenue Culvert.**

(PROJECT)

pursuant to paragraph (7) of subsection (B) of Code Section 50-24-3. Also, the undersigned further certifies that he/she will not engage in the unlawful manufacture, sale, distribution, possession, or use of a controlled substance or marijuana during the performance of the contract.

CONTRACTOR

DATE

NOTARY

DATE

ATTACHMENT B

PROMISE OF NON-DISCRIMINATION STATEMENT

Know All Men By These Presence, that I (We), _____,

Name

_____, _____ (herein after
"Company"),

Title _____ Name of Bidder _____

in consideration of the privilege to bid/or propose on the following
Chatham County project procurement Laroche Avenue Culvert. hereby consent,
covenant and agree as follows:

(1) No person shall be excluded from participation in, denied the benefit of or otherwise discriminated against on the basis of race, color, national origin or gender in connection with the bid submitted to Chatham County or the performance of the contract resulting therefrom;

(2) That it is and shall be the policy of this Company to provide equal opportunity to all business persons seeking to contract or otherwise interested with the Company, including those companies owned and controlled by racial minorities, and women;

(3) In connection herewith, I (We) acknowledge and warrant that this Company has been made aware of, understands and agrees to take affirmative action to provide minority and women owned companies with the maximum practicable opportunities to do business with this Company on this contract;

(4) That the promises of non-discrimination as made and set forth herein shall be continuing throughout the duration of this contract with Chatham County;

(5) That the promises of non-discrimination as made and set forth herein shall be and are hereby deemed to be made a part of and incorporated by reference in the contract which this Company may be awarded;

(6) That the failure of this Company to satisfactorily discharge any of the promises of non-discrimination as made and set forth above may constitute a material breach of contract entitling the County to declare the contract in default and to exercise appropriate remedies including but not limited to termination of the contract.

Signature

Date

Attachment C

DISCLOSURE OF RESPONSIBILITY STATEMENT

Failure to complete and return this information will result in your bid/offer/proposal being disqualified from further competition as non-responsive.

1. List any convictions of any person, subsidiary, or affiliate of the company, arising out of obtaining, or attempting to obtain a public or private contract or subcontract, or in the performance of such contract or subcontract.

2. List any indictments or convictions of any person, subsidiary, or affiliate of this company for offenses such as embezzlement, theft, fraudulent schemes, etc. or any other offenses indicating a lack of business integrity or business honesty which affects the responsibility of the contractor.

3. List any convictions or civil judgments under states or federal antitrust statutes.

4. List any violations of contract provisions such as knowingly (without good cause) to perform, or unsatisfactory performance, in accordance with the specifications of a contract.

5. List any prior suspensions or debarments by any governmental agency.

6. List any contracts not completed on time.

7. List any penalties imposed for time delays and/or quality of materials and workmanship.

8. List any documented violations of federal or any state labor laws, regulations, or standards, occupational safety and health rules.

I, _____, as _____
Name of individual Title & Authority

of _____, declare under oath that

Company Name _____

the above statements, including any supplemental responses attached hereto, are true.

Signature

State of _____

County of _____

Subscribed and sworn to before me on this _____ day of _____

2008 by _____ representing him/herself to be

_____ of the company named herein.

Notary Public

My Commission expires:

Resident State: _____

Attachment D

CONTRACTOR AFFIDAVIT AND AGREEMENT

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm, or corporation which is contracting with (name of public employer) has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

The undersigned further agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to this contract with (name of public employer), contractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A. 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the (name of the public employer) at the time the subcontractor(s) is retained to perform such service.

EEV / Basic Pilot Program* User Identification Number

BY: Authorized Officer or Agent
(Contractor Name)

Date

Title of Authorized Officer or Agent of Contractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

____ DAY OF _____, 200__

Notary Public

My Commission Expires:

* As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot

Program" operated by the U. S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

SUBCONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract with (name of contractor) on behalf of (name of public employer) has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

EEV / Basic Pilot Program* User Identification Number

BY: Authorized Officer or Agent
(Subcontractor Name)

Date

Title of Authorized Officer or Agent of Subcontractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE
____ DAY OF _____, 200__

Notary Public
My Commission Expires:

* As of the effective date of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot Program" operated by the U. S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

ATTACHMENT E

CHATHAM COUNTY, GEORGIA

**BIDDER'S CERTIFICATION REGARDING DEBARMENT, SUSPENSION,
INELIGIBILITY AND VOLUNTARY EXCLUSION**

The undersigned certifies, by submission of this proposal or acceptance of this contract, that neither Contractor nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntary excluded from participation in this transaction by any Federal department or agency, State of Georgia, City of Savannah, Board of Education of local municipality. Bidder agrees that by submitting this proposal that Bidder will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the Bidder or any lower tier participant is unable to certify to this statement, that participant shall attach an explanation to this document.

Bidder must verify Sub-Tier Contractors and Suppliers are not debarred, suspended, ineligible, pending County litigation or pending actions from any of the above government entities.

Certification – the above information is true and complete to the best of my knowledge and belief.

(Printed or typed Name of Signatory)

(Signature)

(Date)

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001

END OF DOCUMENT Mod. CC P & C 6/2005

Attachment F

Construction Apprentice Program Documentation

(must be submitted to Arneja Riley County MWBE Coordinator with 1st Pay Request)

Contractor _____

Name of Project _____

Contract No. _____

- 1) Contractor has contacted CAP office to determine availability of specific labor classes which may be utilized for the project:

Date of Inquiry

of Available Participants

- 2) Anticipated number of CAP students that will be hired and related trade category:

Trade Category _____

Trade Category _____

Trade Category _____

- 3) If CAP students are not anticipated to be hired for this project, the contractor must briefly explain.

Any questions regarding the Construction Apprentice Program and available participant labor should be directed to Tara Sinclair at (912) 604-9574.

Attachment G

Chatham County Minority and Women Business Enterprise Program Proposed MWBE Participation Report

Name of Bidder: _____

Name of Project: _____

Bid No: _____

M/WBE Firm	Type of Work	Contact Person/ Phone #	City, State	%	MBE or WBE

MBE Total _____% WBE Total _____% MWBE Combined _____%

The undersigned must enter into a formal agreement with M/WBE Contractor identified herein for work listed in this schedule conditioned upon execution of contract with the Chatham County Board of Commissioners.

Signature _____ Print _____

Phone () _____ Fax () _____

Attachment H

***Systematic Alien Verification for Entitlements (SAVE)
Affidavit Verifying Status for Chatham County Benefit Application***

By executing this affidavit under oath, as an applicant for a Chatham County, Georgia Business License or Occupation Tax Certificate, Alcohol License, Taxi Permit, Contract or other public benefit as reference in O.C.G.A. Section 50-36-1, I am stating the following with respect to my bid for a City of Savannah contract for

_____. [Name of natural person applying on behalf of individual, business, corporation, partnership, or other private entity]

1.) _____ I am a citizen of the United States.

OR

2.) _____ I am a legal permanent resident 18 years of age or older.

OR

3.) _____ I am an otherwise qualified alien (8 § USC 1641) or non-immigrant under the Federal Immigration and Nationality Act (8 USC 1101 *et seq.*) 18 years of age or older and lawfully present in the United States.*

In making the above representation under oath, I understand that any person who knowingly and willfully makes a false, fictitious, or fraudulent statement or representation in an affidavit shall be guilty of a violation of Code Section 16-10-20 of the Official Code of Georgia.

Signature of Applicant: _____

Date _____

Printed Name: _____

SUBSCRIBED AND SWORN

* _____

BEFORE ME ON THIS THE
citizens.

_____ DAY OF _____, 20____

Alien Registration number for non-

Notary Public

My Commission Expires:

LEGAL NOTICE

CC NO. 165179

Invitation to Bid

Sealed Bids will be received until 2:00 P.M. on MARCH 21, 2012 and publicly opened in Chatham County Purchasing & Contracting Department, at The Chatham County Citizens Service Center, 1117 Eisenhower Drive, Suite C, Savannah, Georgia, for: BID NO : 12-0014-4 LAROCHE AVENUE CULVERT.

MANDATORY PRE-BID CONFERENCE: 2:00 P.M., MARCH 7, 2012. A MANDATORY Pre-Bid Conference will be held at the Chatham County Citizens Service Center, 1117 Eisenhower Drive, Suite C, Savannah, Georgia. Your firm must be represented at this conference to be allowed to submit a bid for this project.

Bid Packages and Plan sheets are available and must be purchased from Clayton Digital Reprographics (CDR) located at 1000-I Eisenhower Drive, Savannah, Georgia, 31406. CDR phone: 912-352-3880, fax 912-352-3881, e-mail: cdrsouth@cdrepro.com

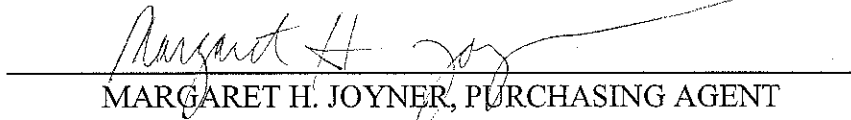
The Bid Package can be downloaded and printed from the County website <http://purchasing.chathamcounty.org> Also, all firms requesting to do business with Chatham County must also register on-line at website <http://purchasing.chathamcounty.org>

For any additional questions regarding this bid , please contact Robert Marshall, Senior Procurement Specialist, at 912-790-1622.or rmarshal@chathamcounty.org

Bid Bond shall be required at the time of bid. (5% of total bid)
Payment and Performance Bonds (100% of bid) will be required for this project at the time of contract award.

CHATHAM COUNTY HAS THE AUTHORITY TO REJECT ALL BIDS AND WAIVE MINOR FORMALITIES.

"CHATHAM COUNTY IS AN EQUAL OPPORTUNITY EMPLOYER, M/F/H, ALL BIDDERS ARE TO BE EQUAL OPPORTUNITY EMPLOYERS"


MARGARET H. JOYNER, PURCHASING AGENT

SAVANNAH NEWS/PRESS INSERT: Feb. 21, Mar. 5, 2012

Please send affidavit to:

Chatham County Purchasing & Contracting Department
1117 Eisenhower Drive, Suite C
Savannah, Georgia 31406
(912) 790-1622