



## **FULTON COUNTY**

**INVITATION TO BID 15ITB062415K-DJ**

**BUFFINGTON ROAD UPGRADE-T188**

**For**

**DEPARTMENT OF PUBLIC WORKS**

**BID DUE DATE AND TIME: November 2, 2015 @ 11:00 A.M.**

**BID ISSUANCE DATE: October 1, 2015**

**PRE-BID CONFERENCE DATE: October 12, 2015**

**PURCHASING CONTACT: Donna Jenkins**

**E-MAIL: [Donna.Jenkins@fultoncountyga.gov](mailto:Donna.Jenkins@fultoncountyga.gov)**

**LOCATION: FULTON COUNTY DEPARTMENT OF PURCHASING  
PUBLIC SAFETY BUILDING  
130 PEACHTREE STREET, S.W., SUITE 1168  
ATLANTA, GA 30303**

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## INVITATION TO BID

### 15-ITB062415K-DJ, BUFFINGTON ROAD UPGRADE-T188

Sealed Bids for furnishing all materials, labor, tools, equipment and appurtenances necessary for **Buffington Road Upgrade-T188** will be received by the Fulton County Department of Purchasing and Contract Compliance at 130 Peachtree Street, S.W. Suite 1168 Atlanta, GA 30303, **no later than 11:00 a.m.**, local time, on **Monday, November 2, 2015**.

The Fulton County Government ("County") in accordance with Title VI of the Civil Rights Act of 1964 and 78 Stat. 252, 42 USC 2000d-42 and Title 49, Code of Federal Regulations. Department of Transportation, Subtitle A, Office of the Secretary, part 21, Nondiscrimination in federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, sex, or national origin in consideration for an award.

#### SCOPE OF WORK

The construction of this project is federally funded and shall comply with all federal requirements. The **Buffington Road Upgrade-T188** project extends along Buffington Road from Royal South Parkway to Roosevelt Highway for a distance of 1.85 miles as a two 12-foot lane upgrade with 5-foot wide sidewalks on the east side and 5 to 6-foot wide sidewalks on the west side as fully described in the project design plans.

The proposed project consists of the following major elements: the addition of curb and gutter, a 2-foot wide grass strip and turning lanes at intersections located at the Vulcan plant, the Coca Cola plant, South Fulton Parkway Spur ramps and Roosevelt Highway. Signal modifications along Buffington Road at Sable Run Road, Naturally Fresh Blvd. and Roosevelt Highway will also be included. As portrayed in the plans, there will be areas around the Chick-fil-A entrance, the Spur 14 exit ramp, and the Auto Auction frontage that will be "Done by Others". As a result of the construction, various City of Atlanta water line adjustments will be required. All other required utility relocations will be handled by the respective utility owner.

**All bids shall be based on the project design plans. Bidders must be on the approved Georgia Department of Transportation's (GDOT) contractor or sub-contractors list.**

**This project has a mandatory Disadvantage Business Enterprise (DBE) goal requirement of twelve percent (12%). The Department reserves the right to reject and disqualify any proposal if the bidder has failed to list bona fide DBE participants with sufficient participation to achieve at least the established goal.**

**The Department may consider for award a bid with less participation than the established goal if both:**

- **the bidder can demonstrate that no greater participation could be obtained;**  
**and**

- **the participation proposed by the low bidder is not substantially less than the participation proposed by the other bidders on the same contract.**

### **METHOD OF SOURCE SELECTION**

This procurement is being conducted in accordance with all applicable provisions of the Georgia Department of Transportation, Standard Specifications Construction of Transportation Systems.

### **PERMITS [Required]**

All anticipated federal, state and local permits required for the project have been obtained. Contractor will be required to obtain an NOI permit.

### **RIGHTS OF WAY/EASEMENTS [Required]**

All anticipated rights of way and easements have been obtained.

### **PROJECT REQUIREMENTS**

**Prequalification of Bidders:** Georgia Department of Transportation ("Department") specification 102.01 governs this solicitation. Specification 102.01 states that before submitting a bid in excess of \$2,000,000, the Bidder shall have been prequalified with the Department and received a Certificate of Qualification in accordance with the rules and regulations approved and adopted by the State Transportation Board. Bidders submitting bids of \$2,000,000 or less shall have been registered with the Department. In addition, the aggregate total amount of a non-prequalified Bidder may have under contract shall not exceed \$4,000,000. As part of the evaluation process for bidders, GDOT eligibility will be verified.

**Bidders intending to consistently submit Proposals shall prequalify at least once every two years. However, qualifications may be changed during that period upon the submission of additional favorable reports or upon unsatisfactory performance. In addition, the Department reserves the right at any time to require the Contractor to furnish a current financial and experience statement.**

**Liquidated Damages:** Liquidated damages shall apply in accordance with the State of Georgia Standard Specifications Section 108.08.

**Testing:** All testing is to meet the requirements outlined in the GDOT Sampling, Testing, and Inspection Guide.

**Qualified Products List:** The Contractor shall use suppliers on the appropriate GDOT Qualified Products List.

**Required Forms:** The completed DBE Goals Form, Federal Aid Certification and Georgia Security Immigration Compliance Act Affidavit shall be submitted with the bid.

### **BID DOCUMENTS**

This document and supporting documents can be downloaded at the Fulton County Website, <http://www.fultoncountyga.gov> under "Bid opportunities". The Bid Documents and Drawings for this project may be examined and copies obtained at a cost of \$307.00 plus tax at the following location(s):

Action Blueprint  
2705 Monroe Drive  
Atlanta, Georgia 30324  
(404) 885-1433  
Web site: www.actiondis.com

A viewing copy **(FOR VIEWING PURPOSES ONLY)** of the Drawings will be available in the Department of Purchasing & Contract Compliance Plan Room located at 130 Peachtree Street, S.W. Suite 1168, Atlanta, Georgia 30303.

#### **PURCHASING CONTACT**

Information regarding the bid or bid requirements, either procedural or technical, may be obtained by submitting questions in writing to:

Fulton County Government  
Department of Purchasing  
Attn: Donna Jenkins  
Public Safety Building, 1<sup>st</sup> Floor  
130 Peachtree Street, S.W. Suite 1168  
Atlanta, GA 30303  
Email: Donna.Jenkins@fultoncountyga.gov  
Fax: (404) 335-5807  
Reference Bid #: 15ITB062415K-DJ

#### **PRE-BID CONFERENCE**

Date: Monday, October 12, 2015

Time: 1:30 P.M.

Location: Department of Purchasing Bid Conference Room  
Fulton County Government Center, Public Safety Building, 1<sup>st</sup> Floor  
130 Peachtree Street, S.W., Suite 1168  
Atlanta, Georgia 30303-3459

Inquiries regarding the solicitation either technical or otherwise may be submitted in writing prior to the Pre-Bid Conference and will be addressed at the Pre-Bid Conference.

Any additional questions asked at the Pre-Bid Conference must be submitted in written form at the Pre-Bid Conference and will be responded to in the form of an addendum with the County's official responses.

The Pre-Bid Conference will be conducted for the purpose of explaining the County's bid process, the specifications/technical documents, and to provide non-binding verbal responses to questions concerning these bid specifications and to discuss issues from the Bidders perspective. However, no verbal response provided at the Pre-Bid Conference binds the County. Only those responses to written questions that are responded to by the County in written communications via an addendum will be official.

Fulton County does not discriminate on the basis of disability in the admission or access to its programs or activities. Any requests for reasonable accommodations required by individuals to fully participate in any open meeting, program or activity of Fulton County

Government should be directed to Rholanda Stanberry, Contract Compliance Administrator at email: [rholanda.stanberry@fultoncountyga.gov](mailto:rholanda.stanberry@fultoncountyga.gov).

### **BONDING REQUIREMENTS**

Each Bid must be accompanied by a Bid Bond, prepared on the Bid Bond provided in this Bid Document or a Surety Company's Standard Bid Bond, duly executed by the Bidder as principal and having as surety, a surety company licensed to do business in the State of Georgia by the Georgia Insurance Commissioner and listed in the latest issue of U.S. Treasury Circular 570, in the amount of five percent of the Bid.

The successful Bidder for this Contract will be required to furnish a satisfactory Performance Bond in the amount of 100% of the contract amount and a Payment Bond in the amount of 110% of the contract amount, and proof of insurance in accordance with the requirements set forth in Section 5 of this Bid Document.

***END OF SECTION***

**OWNER - CONTRACTOR AGREEMENT**

**15ITB062415K-DJ, BUFFINGTON ROAD UPGRADE-T188**

Contractor: \_\_\_\_\_ Project No. \_\_\_\_\_

Address: \_\_\_\_\_ Telephone: \_\_\_\_\_

Contact: \_\_\_\_\_ Facsimile: \_\_\_\_\_

THIS AGREEMENT is effective as of the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between Fulton County, a political subdivision of the State of Georgia (hereinafter called the "County"), and the above named CONTRACTOR in accordance with all provisions of this Construction agreement, consisting of the following Contract Documents:

- Exhibit A: General Conditions
- Exhibit B: Special Conditions (if applicable)
- Exhibit C: Addenda
- Exhibit D: Bid Form
- Exhibit E: Bonds (Bid, Payment & Performance)
- Exhibit F: Scope of Work and Technical Specifications
- Exhibit G: Exhibits
- Exhibit H: Purchasing Forms
- Exhibit I: DBE Goals Form
- Exhibit J: Risk Management Insurance Provisions Forms

WITNESSETH: That the said Contractor has agreed, and by these presents does agree with the said County, for and in consideration of a Contract Price of **[INSERT CONTRACT AMOUNT IN WORDS]**, (**[\$[INSERT CONTRACT AMOUNT IN NUMBERS]**) and other good and valuable consideration, and under the penalty expressed on Bonds hereto attached, to furnish all equipment, tools, materials, skill, and labor of every description necessary to carry out and complete in good, firm, and substantial, and workmanlike manner, the Work specified, in strict conformity with the Drawings and the Specifications hereinafter set forth, which Drawings and Specifications together with the bid submittals made by the Contractor, General Conditions, Special Provisions, Detailed Specifications, Exhibits, and this Agreement, shall all form essential parts of this Contract. The Work covered by this Contract includes all Work indicated on Plans and Specifications and listed in the Bid entitled:

**Project Number: 15062415K-DJ**

**BUFFINGTON ROAD UPGRADE-T188**

The Contractor, providing services as an Independent Contractor, shall commence the Work with adequate force and equipment within 10 days from receipt of Notice to Proceed ("NTP") from the County, and shall complete the work within 547 available days from the Notice to Proceed or the date work begins, whichever comes first. The Contractor shall remain responsible for performing, in accordance with the terms of the contract, all work assigned prior to the expiration of the said calendar days allowed for

completion of the work even if the work is not completed until after the expiration of such days. The Contractor shall agree that in the performance of this contract he will comply with all lawful agreements, if any, which the contractor has made with any association, union or other entity, with respect to wages, salaries and working conditions, so as to cause inconvenience, picketing or work stoppage.

*For each calendar day that any work remains uncompleted after the time allowed for completion of the work, the Contractor shall pay the County the sum of \$ 500.00 not as a penalty but as liquidated damages, which liquidated damages the County may deduct from any money due the contractor. At the County's convenience and not to it prejudice the County may provide written notice of the commencement of the assessment of liquidated damages].*

As full compensation for the faithful performance of this Contract, the County shall pay the Contractor in accordance with the General Conditions and the prices stipulated in the Bid, hereto attached.

It is further mutually agreed between the parties hereto that if, at any time after the execution of this Agreement and the Surety Bonds hereto attached for its faithful performance, the County shall deem the surety or sureties upon such bonds to be unsatisfactory, or, if, for any reason, such bonds cease to be adequate to cover the performance of the Work, the Contractor shall, at his expense, within five days after receipt of notice from the County so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the County. In such event no further payment to the Contractor shall be deemed to be due under this Agreement until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the County.

The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any and all persons, including the Contractor's agents, servants, and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this contract or the prosecution of work hereunder, whether caused by the Contractor or the Contractor's agents, Servants, or employees, or by any of the Contractor's subcontractors or suppliers, and the Contractor shall indemnify and hold harmless the County, the Construction Manager, County's Commissioners, officers, employees, successors, assigns and agents, or any of their subcontractors from and against any and all loss and/or expense which they or any of them may suffer or pay as a result of claims or suits due to, because of, or arising out of any and all such injuries, deaths and/or damage, irrespective of County or Construction Manager negligence (except that no party shall be indemnified for their own sole negligence). The Contractor, if requested, shall assume and defend at the Contractor's own expense, any suit, action or other legal proceedings arising there from, and the Contractor hereby agrees to satisfy, pay, and cause to be discharged of record any judgment which may be rendered against the County and the Construction Manager arising there from.

In the event of any such loss, expense, damage, or injury, or if any claim or demand for damages as heretofore set forth is made against the County or the Construction Manager, the County may withhold from any payment due or thereafter to become due to the Contractor under the terms of this Contract, an amount sufficient in its

judgment to protect and indemnify it and the Construction Manager, County's Commissioners, officers, employees, successors, assigns and agents from any and all claims, expense, loss, damages, or injury; and the County, in its discretion, may require the Contractor to furnish a surety bond satisfactory to the County providing for such protection and indemnity, which bond shall be furnished by the Contractor within five (5) days after written demand has been made therefore. The expense of said Bond shall be borne by the Contractor. **[See General Conditions for similar provisions]**

This Contract constitutes the full agreement between the parties, and the Contractor shall not sublet, assign, transfer, pledge, convey, sell or otherwise dispose of the whole or any part of this Contract or his right, title, or interest therein to any person, firm or corporation without the previous consent of the County in writing. Subject to applicable provisions of law, this Contract shall be in full force and effect as a Contract, from the date on which a fully executed and approved counterpart hereof is delivered to the Contractor and shall remain and continue in full force and effect until after the expiration of any guarantee period and the Contractor and his sureties are finally released by the County.

This agreement was approved by the Fulton County Board of Commissioner on [Insert approval date and item number].

[SIGNATURES NEXT PAGE]

**IN WITNESS THEREOF**, the Parties hereto have caused this Contract to be executed by their duly authorized representatives as attested and witnessed and their corporate seals to be hereunto affixed as of the day and year date first above written.

OWNER:

CONTRACTOR:

**FULTON COUNTY, GEORGIA**

***[Insert Contractor COMPANY NAME]***

\_\_\_\_\_  
John H. Eaves, Commission Chair  
Board of Commissioners

\_\_\_\_\_  
***[Insert Name & Title of person authorized to sign contract]***

ATTEST:

ATTEST:

\_\_\_\_\_  
Mark Massey  
Clerk to the Commission (Seal)

\_\_\_\_\_  
Secretary/  
Assistant Secretary  
  
(Affix Corporate Seal)

APPROVED AS TO FORM:

\_\_\_\_\_  
Office of the County Attorney

APPROVED AS TO CONTENT:

\_\_\_\_\_  
***[Insert Department Head Name]***  
***[Insert Department Head Title]***

**END OF SECTION**

## INSTRUCTIONS TO BIDDERS

### 1. CONTRACT DOCUMENTS

The Contract Documents include the Contract Agreement, Contractor's Bid (including all documentation accompanying the Bid and any post-Bid documentation required by the County prior to the Notice of Award), Bonds, all Special Conditions, General Conditions, Supplementary Conditions, Specifications, Drawings and addenda, together with written amendments, change orders, field orders and the Construction Manager's written interpretations and clarifications issued in accordance with the General Conditions on or after the date of the Contract Agreement.

Shop drawing submittals reviewed in accordance with the General Conditions, geotechnical investigations and soils report and drawings of physical conditions in or relating to existing surface structures at or contiguous to the site are not Contract Documents.

The Contract Documents shall define and describe the complete work to which they relate.

### 2. BID PREPARATION

Bidders shall **SUBMIT ONE (1) ORIGINAL, SIGNED AND DATED, AND TWO (2) COPIES** on the forms provided in the Bid Document.

All bids must be made on the bid forms contained herein and shall be subject to all requirements of the Agreement Documents. All bids must be regular in every respect and no interlineations, excisions, or special conditions shall be made or included in the bid by the Bidder.

Lump sum, unit price and extensions of unit prices must be entered in the appropriate spaces provided on the Bid Schedule/Bid Form. Unit prices shall include an appropriate allocation of overhead and other indirect costs so that the summation of unit price extensions and lump sum items represents the total bid amount. All blank spaces must be typed or hand written in blue ink on the "Original". All dollar amounts must be BOTH in writing and figures and represent prices for the published scope of work without exceptions.

The County may, in its sole discretion, reject any bid determined as irregular, a conditional bid or any bid on which there is an alteration of, or departure from the Bid Schedule attached.

Erasures or other changes in the bids must be explained or noted over the signature of the Bidder. All corrections to any entry must be lined out and initialed by the Bidder. Please do not use correction tapes or fluid. Failure to do so shall render the Bidder as non-responsive and cause rejection of the bid.

Failure to execute the Bid Schedule/Bid Form documents may result in Bidder being deemed non-responsive and cause rejection of the bid.

### **3. RECEIPT AND OPENING OF BIDS**

Sealed bids will be received by the Fulton County Department of Purchasing & Contract Compliance at Fulton County Public Safety Building, 130 Peachtree Street, S.W., Suite 1168 Atlanta, Georgia 30303. All submitted bids shall be time and date stamped according to the clock at the front desk of the Fulton County Department of Purchasing & Contract Compliance. The original signed Bid with three (3) copies shall be submitted in a sealed envelope, addressed to the Department of Purchasing and Contract Compliance and labeled **15ITB062415K-DJ, BUFFINGTON ROAD UPGRADE – T188**.

**REQUIRED SUBMITTALS:** The bidder **must complete and execute** the following:

1. Bid Form
2. Acknowledgement of each Addendum
3. Bid Bond
4. Purchasing Forms (See Submittal Check List at end of this Section), fully executed
5. Contract Compliance Forms (See Submittal Check List at end of this Section), fully executed
6. Risk Management Insurance Provisions Form

Any bids received after the stated time and date will not be considered. It shall be the sole responsibility of the bidder to have his/her bid delivered to the Fulton County Department of Purchasing and Contract Compliance for receipt on or before the stated time and date. If a bid is sent by U.S. Mail, the bidder shall be responsible for its timely delivery to the Purchasing Department. Bids delayed by mail will not be considered, shall not be opened, and arrangements shall be made for their return at the bidder's request and expense.

Bid shall be publicly opened, with only the names and total bid price of the bidders disclosed at the opening.

### **4. ADDENDA AND INTERPRETATIONS**

No interpretations of the meaning of the Drawings, Specifications or other pre-bid documents will be made to any Bidder orally. Bidders requiring clarification or interpretation of the Contract Documents shall make a request in writing, either by mail, hand delivery, e-mail or fax, to the Purchasing Agent at the address below. To be given consideration, requests must be received no later than 4:00 PM, Monday, October 26, 2015. The County will not respond to any requests, oral or written, received after this date. Telephone inquiries will not be accepted.

Department of Purchasing and Contract Compliance  
Attn: Donna Jenkins, Chief Assistant Purchasing Agent  
Fulton County Public Safety Building

130 Peachtree Street, S.W., 1168  
Atlanta, GA 30303  
Fax: (404) 335-5807  
Donna.Jenkins@fultoncountyga.gov  
Bid # 15ITB062415K-DJ

Only communications from firms that are in writing and signed will be recognized by the County as duly authorized expressions on behalf of proposers/bidders. Any and all such interpretations and any supplemental instructions will be in the form of written Addenda to the Specifications which, if any addend are issued to this Invitation to Bid.

Failure of Bidders to receive or acknowledge any Addendum shall not relieve them of any obligation under the Bid. All Addenda shall become part of the Contract Documents.

**5. SITE EXAMINATION**

***Select one of the following:***

There will not be a scheduled site visit for this project. However, bidders are encouraged to visit the project site on their own.

**6. BIDDER'S MODIFICATION AND WITHDRAWAL OF BIDS**

A Bidder may modify or withdraw its bid by written request, provided that the request is received by the County prior to the bid due date and time at the address to which bids are to be submitted. Provided further, that in case of an electronic request (i.e. facsimile, e-mail, etc.) a written confirmation thereof over the authorized signature of the Bidder must be received by the County at the address to which original Bids are to be submitted within three (3) calendar days after issue of the electronic message. Following withdrawal of its bid, the Bidder may submit a new bid, providing delivery is affected prior to the established bid opening date and time. **No bid may be withdrawn after bid due date for sixty (60) calendar days.**

**7. BID AND CONTRACT SECURITY**

A bid bond is required for this project. A Bid Bond in an amount equal to five percent (5%) of the bid amount must accompany each Bid. The Bid Bond must be submitted with the Bid.

**Bids must be accompanied by a bid bond or certified check** in an amount of five percent (5%) of the TOTAL AMOUNT of the base bid. The bid bond or certified check shall apply ONLY TO THIS BID. The bid name and contract number must appear on the security instrument. The bond must remain in full force and effect until the Bidder executes the final Contract. Bids not satisfying the bonding requirements of this project will be declared non-responsive.

Any bid bond, performance bond, payment bond, or security deposit required for public works construction contract shall be approved and filed with purchasing

agent. At the option of the County, if the surety named in the bond is other than a surety company authorized by law to do business in this state pursuant to a current certificate of authority to transact surety business by the Commissioner of Insurance, such bond shall not be approved and filed unless such surety is on the United States Department of Treasury's list of approved bond sureties.

A Purchasing Agent shall approve as to form and as to the solvency of the surety any bid bond, performance bond, or payment bond required by this. In the case of a bid bond, such approval shall be obtained prior to acceptance of the bid or proposal. In the case of payment bonds and performance bonds, such approval shall be obtained prior to the execution of the contract.

Whenever, in the judgment of the County:

- (1) Any surety on a bid, performance, or payment bond has become insolvent;
- (2) Any corporation surety is no longer certified or approved by the Commissioner of Insurance to do business in the state; or
- (3) For any cause there are no longer proper or sufficient sureties on any or all the bonds

The County may require the contractor to strengthen any or all of the bonds or to furnish a new or additional bond or bonds within ten days. Thereupon, if so ordered by the County, all work on the contract shall cease unless such new or additional bond or bonds are furnished. If such bond or bonds are not furnished within such time, the County may terminate the contract and complete the same as the agent of and at the expense of the contractor and his or her sureties.

As a condition of responsiveness the bidder must contain a Bid Bond for an amount equal to 5% of the bid amount. The Bid Bond shall be included in a separate envelope marked on the outside "Bid Bond". Checks or letters of credit of any type will not be accepted. A certified cashier's check will be acceptable. Provide a completed and fully executed Bid Bond. When the bidder's package is opened, a purchasing agent will verify the presence of the Bid Bond and remove it from the Proposal Package.

If the bidder withdraws its bid from the competition after the selection of its bid for a reason not authorized by Georgia law, the County will proceed on the Bid Bond, along with any other available remedies.

The Surety of the Bid Bond shall be from a surety company authorized to do business in the State of Georgia, shall be listed in the Department of Treasury Circular 570, and shall have an underwriting limitation in excess of 100% of the bid amount. The Bonds and Surety shall be subject to approval by the County Attorney.

Attorneys-in-fact for bidders who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

**8. SURETY BONDS**

The submission of surety bonds subsequent to the Bid submission shall be:

- a. Any surety bond submitted in accordance with the Bid or Agreement requirements must be issued by a corporate surety company satisfactory to the Commission and authorized to act as such in the State of Georgia;
- b. Such bonds shall conform to the forms provided with the Bid Documents and be completed in accordance with the instructions thereon; and
- c. In accordance with Georgia law, and upon award of the Contract, a separate Performance Bond in the amount of 100% of the contract amount and a Payment Bond in the amount of 110% of the contract amount shall be required of the successful Bidder. The Performance Bond shall remain in effect for one (1) year after final acceptance of the Work of the guaranty period under the Contract, whichever is larger.

The payment bond shall remain in effect for the period required under Georgia law for the payment bonds on public construction agreements. Reference is made to the bond forms and the Agreement Documents for additional particulars of the terms required in the bonds. In the case of any inconsistency between the Bond Forms and Georgia law, the law shall control. Alterations, extension of the time allowed for performance, extra and additional Work, and other changes authorized under the Agreement may be made without notice to or consent of the surety or sureties.

**9. INSURANCE REQUIREMENTS**

The Contractor shall procure and maintain during the life of this Agreement, Workmen's Compensation, Public Liability, Property Damage, Automobile Liability insurance and any other insurance necessary to satisfy the requirements of the Agreement Documents. At the time of award, a copy of the successful Bidder's Certificate of Insurance must be provided through the County's online insurance compliance system.

The County has implemented an online insurance compliance system designed to make the experience of submitting and retrieval of insurance information quick and easy. This system is designed to be used by insurance brokers and agents on behalf of their insurance clients for submittal of Certificates of Insurance ("COI") directly to the Fulton County Department of Purchasing. Instructions will be provided to the successful bidder.

**10. RIGHT TO REJECT BIDS**

The County reserves the right to reject any or all bids and to waive informalities. No bids will be received after the time set for opening bids. Any unauthorized conditions, limitations or provisions attached to the Bid, except as provided herein, will render it informal and may cause its rejection. Unbalanced bids will be subject

to rejection. Any bidder may withdraw his/her bid, either personally or by telegraphic or written request, at any time prior to the scheduled closing time for receipt of bids. Telegraphic or written requests for withdrawal must be in the possession of the County prior to the closing time for receipt of bids.

#### **11. APPLICABLE LAWS**

All applicable laws and regulations of the State of Georgia and ordinances and regulations of Fulton County shall apply. Protestors shall seek resolution of their complaints in the manner provided in the Fulton County Purchasing Code §102-488 et. seq., which is incorporated by reference herein.

#### **12. EXAMINATION OF CONTRACT DOCUMENTS**

Prospective bidders shall examine the contract documents and before submitting a bid, shall make a written request to the County for an interpretation or correction of any ambiguity, in consistency or error therein which could be discovered by a bidder. At the bid opening each bidder shall be presumed to have read and be familiar with the contract documents.

#### **13. BID EVALUATION**

- a. Each Bid timely received and in the County's hands at the time set forth for the Bid opening shall constitute an offer to perform the Agreement on the terms and conditions thereof, in strict accordance with the Agreement documents, and all other requirements, all for the Bid total. For good cause and valuable consideration, the sufficiency of which is acknowledged by submittal of a Bid, each Bidder promises and agrees that its Bid shall be irrevocable for a period of **sixty calendar days** after the Bid opening and will not be withdrawn or modified during that time. The County may accept any Bid by giving the Bidder Written Notice of acceptance during that time. If necessary, the period of time specified may be extended by written agreement between the County and the Bidder or Bidders concerned.
- b. After the Bids have been opened and before any award is made, the County will evaluate the Bid process, the Bid total, the supplements to the Bid form, Bidder's experience, proposed Subcontractors and equipment manufacturers and other data relating to Bidders' responsibility and qualifications to perform the Agreement satisfactorily.
- c. All extension of the unit prices shown and the subsequent addition of extended amounts may be verified by the County. In the event of a discrepancy between the unit price bid and the extension, the unit price will be deemed intended by the Bidder and the extension shall be adjusted. In the event of a discrepancy between the sum of the extended amounts and the bid total, the sum of the extended amounts shall govern.
- d. Bidder may be required to submit, in writing, the addresses of any proposed Subcontractors or Equipment manufacturers listed on the Bid, and to submit other material information relative to proposed Subcontractors or Equipment manufacturers. The County reserves the right to disapprove any proposed

- Subcontractor or Equipment manufacturers whose technical or financial ability or resources or whose experience are deemed inadequate.
- e. The County reserves the right to reject any Bid the prices of which appear to be unbalanced, and to reject any or all Bids, or parts thereof, if it determines, in its sole discretion, that such rejection is in the best interest of the Commission. Where only a single responsible and responsive Bid is received, the County may in its sole discretion, elect to conduct a price or cost analysis of the Bid. Such Bidder shall cooperate with such analysis and provide such supplemental information as may be required. The determination whether to enter into an Agreement with such sole Bidder shall be solely within the County's discretion and not dependent upon performance of a price or cost analysis.
  - f. Bids will be evaluated on the basis of determining the lowest Bid total of a Bidder, not including alternates, whose Bid is responsive to the Invitation to Bid and who is determined to be technically, financially and otherwise responsible to perform the Agreement satisfactorily, and to meet all other requirements of the Bidding Documents relating thereto. Any Bid may be rejected if it is determined by the County to be non-responsive, provided, however, that the Commission reserves the right to waive any irregularities or technicalities which it determines, within its sole discretion, to be minor in nature and in the interest of the public. Furthermore, any Bid may be rejected if it is determined by the County, in its sole discretion, that the Bidder is not capable of performing the Agreement satisfactorily based upon review of its experience and technical and financial capabilities, or the failure of such bidder to provide information requested relating to such determination. Additionally, the County reserves the right to disqualify Bids, before and after the bid opening, upon evidence of collusion with intent to defraud or other illegal practices upon the part of any Bidder(s).
  - g. The County intends to award the Agreement at the earliest practicable date to the lowest responsive, responsible Bidder(s), provided that the Bid is within the funds available for the project. In addition, the Commission reserves the right to reject all Bids if it determines, in its sole discretion, that the public interest will be best served by doing so.
  - h. A Pre-award Conference may be conducted with the apparent low Bidder(s) to review general requirements of the Bidding Documents.

#### **14. AWARD CRITERIA**

Award will be made after evaluating the prices, responsiveness and responsibility of each Bidder.

- A. **Responsiveness:** The determination of responsiveness will be determined by the following:
  - a. The completeness of all material, documents and/or information required by the County;

- b. Whether the bidder has submitted a complete Bid form without irregularities, excisions, special conditions, or alternative bids for any item unless specifically requested in the Bid form.

**B. Responsibility:** The determination of the bidder's responsibility will be determined by the following

- a. The ability, capacity and skill of the Bidder to perform and/or provide the Work required;
- b. The County reserves the right to reject any bid if the evidence submitted by, or investigation of, the bidder fails to satisfy the County that he/she is properly qualified to carry out the obligations of the Contract;
- c. The character, integrity, reputation, judgment, experience and efficiency of the Bidder;
- d. The quality of performance of work on previous contracts or work; Maintains a permanent place of business individually or in conjunction with the prime contractor.
- e. Has the appropriate and adequate technical experience necessary to perform the Work;
- f. Has adequate personnel and equipment to do the Work expeditiously;
- g. Has suitable financial means to meet obligations incidental to the work.

#### **15. DISQUALIFICATION OF BIDDERS**

Any of the following may be considered as sufficient for disqualification of a Bidder and the rejection of the Bid:

- a. Submission of more than one Bid for the same work by an individual, firm, partnership or Corporation under the same or different name(s);
- b. Evidence of collusion among Bidders;
- c. Previous participation in collusive bidding on Work for the County;
- d. Submission of an unbalanced Bid, in which the prices quoted for same items are out of proportion to the prices for other items;
- e. Lack of competency of Bidder. The Agreement will be awarded only to a Bidder(s) rated as capable of performing the Work.

#### **16. BASIS OF AWARD**

The Contract, if awarded, will be awarded to the lowest reliable bidder whose proposal shall have met all the prescribed requirements.

The low bid will be determined based on the sum of the base bid. The base bid is the amount upon which the Bidder will be formally evaluated and which will be used to determine the lowest reliable bidder.

No bid may be withdrawn for a period of sixty (60) days after the date of bid opening except as permitted by O.C.G.A., §36-91-41 et seq., as amended. Each Bid must be accompanied by a Bid Bond in accordance with the Bid Bond Requirements provided in the Contract Documents, on a Surety Company's Standard Bid Bond Form acceptable to the County in an amount no less than 5% of the amount bid. The successful bidder will be required to furnish a Performance Bond in the amount of 100% of the contract amount and a Payment Bond in the amount of 110% of the contract amount, **on or before** the issuance of Notice to Proceed. All other required Contract Documents must be fully completed and executed by the Contractor and his/her Surety, and submitted to the Owner **on or before** the issuance of the Notice to Proceed.

**17. GEORGIA UTILITY CONTRACTORS LICENSE (APPLICABLE)**

A Utility Contractor's License is required to perform this work in accordance with O.C.G.A. §43-14-8.2(h). Bids for utility contracting projects must be from a licensed utility contractor and that licensed utility contractor must be the prime on this project. It is not permissible for an unlicensed individual/firm to subcontract with a licensed utility contractor for this project. Form C1: Georgia Utility Certification in Section 6. Purchasing Forms must be completed and submitted by the contractor performing the work.

**18. GENERAL CONTRACTORS LICENSE (APPLICABLE)**

General contractors are required to be licensed by the State of Georgia to perform the following work: construction, construction management services or design-build services as a prime contractor, joint venture partner or as a subcontractor to design professional acting as a prime contractor as part of a design-build entity or combination, unless exempted from holding such license pursuant to Georgia law O.C.G.A. §43-41-17. If exempted, Contractor must submit a copy of their Georgia Department of Transportation Certificate of Qualification with their bid submittal.

Bidders must complete Form C2: Georgia General Contractors License Certification in Section 6, Purchasing Forms. Failure to provide the required license shall deem your bid non-responsive.

**19. PROFESSIONAL LICENSES (NON-APPLICABLE)**

The State of Georgia requires that the following professions are required by state law to be licensed:

- Electricians
- Plumbers
- Conditioned Air Contractors
- Low voltage Contractors

Bidders and any sub-contractors performing any of the above described work must provide a copy of their license for the work they will perform on this project. Bidders must complete Form C3: Georgia Professional License Certification in

Section 6, Purchasing Forms Failure to provide the required license may deem your bid non-responsive.

## **20. DAVIS-BACON WAGE RATES**

This is a federally funded project and Davis-Bacon and related acts, apply to contractors and subcontractors performing on federally funded or assisted contracts in excess of \$2,000 for the construction, alteration, or repair (including painting and decorating) of public buildings or public works. Contractors and subcontractors must pay their laborers and mechanics employed under the contract no less than the locally prevailing wages and fringe benefits for corresponding work on similar projects in the area. The current wage rate determination for this project is attached herein in Section 11.

## **21. NOTICE OF AWARD OF CONTRACT**

As soon as possible, and within sixty (60) days after receipt of bids, the County shall notify the successful Bidder of the Award of Contract.

The award shall be made by the Board of Commissioners of Fulton County to the lowest responsive, responsible bidder(s) as soon as possible after receipt of bids, taking into consideration price and the responsiveness to the requirements set forth in the Invitation for Bid. In such case, no claim shall be made by the selected Contractor(s) for loss of profit if the contract is not awarded or awarded for less work than is indicated and for less than the amount of his bid. The total of the awarded contract shall not exceed the available funds allocated for this project.

Should the County require additional time to award the contract, the time may be extended by mutual agreement between the County and the successful bidder. If an Award of Contract has not been made within sixty (60) days from the bid date or within the extension mutually agreed upon, the Bidder may withdraw the Bid without further liability on the part of either party.

Any award made by the Board of Commissioners as a result of this bid will begin from the date of the notice to proceed. The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written order from the user department. The contract shall become effective on the Contract Date and shall continue in effect until the end of the term of the contract or until the project has been closed-out unless earlier terminated pursuant to the termination provisions of the contract.

## **22. EXECUTION OF CONTRACT DOCUMENTS**

Upon notification of Award of Contract, the County shall furnish the Contractor the conformed copies of Contract Documents for execution by the Contractor and Contractor's surety.

Within ten (10) days after receipt the Contractor shall return all the documents properly executed by the Contractor and the Contractor's surety. Attached to each document shall be an original power-of-attorney for the person executing the

bonds for the surety and certificates of insurance for the required insurance coverage.

After receipt of the documents executed by the Contractor and his surety with the power-of-attorney and certificates of insurance, the County shall complete the execution of the documents. Distribution of the completed documents will be made upon completion.

Should the contractor and/or surety fail to execute the documents within the time specified, the County shall have the right to proceed on the Bid Bond accompanying the bid.

If the County fails to execute the documents within the time limit specified, the Contractor shall have the right to withdraw the Contractor's bid without penalty.

Should an extension of any of the time limits stated above be required, this shall be done only by mutual agreement between both parties.

Any agreement or contract resulting from the acceptance of a bid shall be on a County approved document form. The County reserves the right to reject any agreement that does not conform to the Invitation for Bid and any County requirements for agreements and contracts. The County reserves the right to modify the agreement resulting from this bid upon the recommendation of the County Attorney.

### **23. DISADVANTAGED BUSINESS ENTERPRISE (DBE) GOALS**

This project has a mandatory Disadvantaged Business Enterprise (DBE) goal requirement of **Twelve Percent (12%)**. The Department reserves the right to reject and disqualify any proposal if the bidder has failed to list bona fide DBE participants with sufficient participation to achieve at least the established goal.

The Department may consider for award a bid with less participation than the established goal if both:

The bidder can demonstrate that no greater participation could be obtained, and

The participation proposed by the low bidder is not substantially less than the participation proposed by the other bidders on the same contract.

### **24. JOINT VENTURE**

Any Bidder intending to respond to this solicitation as a joint venture must submit an executed joint venture agreement with its offer. The agreement must designate those persons or entities authorized to execute documents or otherwise bind the joint venture in all transactions with Fulton County, or be accompanied by a document, binding upon the joint venture and its constituent members, making such designation. Offers from joint ventures that do not include these documents will be rejected as being non-responsive.

## **25. GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT**

This Invitation to Bid is subject to the Georgia Security & Immigration Compliance Act. Effective July 1, 2013, bidders and proposers are notified that all bids/proposals for services that are to be physically performed within the State of Georgia must be accompanied by proof of their registration with and continuing and future participation in the E-Verify program established by the United States Department of Homeland Security. Physical performance of services means any performance of labor or services for a public employer using a bidding process or by contract wherein the labor or services exceed \$2,499.99 99 (except for services performed by an individual who is licensed pursuant to Title 26, Title 43, or the State Bar of Georgia).

A completed affidavit must be submitted on the top of the bid/proposal at the time of submission, prior to the time for opening bids/proposals. Under state law, the County cannot consider any bid/proposal which does not include a completed affidavit. It is not the intent of this notice to provide detailed information or legal advice concerning the Georgia Security & Immigration Compliance Act. All bidders/proposers intending to do business with the County are responsible for independently apprising themselves and complying with the requirements of that law and its effect on County procurements and their participation in those procurements. For additional information on the E-Verify program or to enroll in the program, go to: <https://e-verify.uscis.gov/enroll>.

The Director of Purchasing & Contract Compliance is authorized to conduct random audits of a contractor's or subcontractors' compliance with the Illegal Immigration Reform and Enforcement Act and the rules and regulations of the Georgia Department of Labor.

See Section 6, Purchasing Forms & Instructions for declarations and affidavits.

## **26. SUBCONTRACTING OPPORTUNITIES**

Potential prime contractors submitting a bid on this project for Fulton County and are seeking subcontractors and/or suppliers can advertise those subcontracting opportunities on the County's website, <http://www.fultoncountyga.gov> under "Subcontracting Bid Opportunities".

## **27. TERM OF CONTRACT**

The term of the Contract shall be for a period of 1,095 calendar days, or as may be amended under the Contract to comprise the Contract Time. Contractor shall commence the Work within ten calendar days after receipt of Notice to Proceed and shall substantially complete the Work within Two Hundred Seventy Three (273) available days from issuance of the Notice to Proceed.

## **28. NO CONTACT PROVISION**

It is the policy of Fulton County that the evaluation and award process for County contracts shall be free from both actual and perceived impropriety, and that contacts between potential vendors and County officials, elected officials and staff regarding pending awards of County contracts shall be prohibited.

- A. No person, firm, or business entity, however situated or composed, obtaining a copy of or responding to this solicitation, shall initiate or continue any verbal or written communication regarding this solicitation with any County officer, elected official, employee, or designated County representative, between the date of the issuance of this solicitation and the date of the County Manager's recommendation to the Board of Commissioners for award of the subject contract, except as may otherwise be specifically authorized and permitted by the terms and conditions of this solicitation.
- B. All verbal and written communications initiated by such person, firm, or entity regarding this solicitation, if same are authorized and permitted by the terms and conditions of this solicitation, shall be directed to the Purchasing Agent.
- C. Any violation of this prohibition of the initiation or continuation of verbal or written communications with County officers, elected officials, employees, or designated County representatives shall result in a written finding by the Purchasing Agent that the submitted Bid or proposal of the person, firm, or entity in violation is "non-responsive", and same shall not be considered for award.

## **29. AUTHORIZATION TO TRANSACT BUSINESS**

If the Contractor is a corporation or corporations combined to form a joint venture, the corporation or members of the joint venture team, prior to Agreement execution, must submit documentary evidence from the Secretary of State that the corporation is in good standing and that the corporation is authorized to transact business in the State of Georgia.

## **30. PRE-CONSTRUCTION CONFERENCE**

A Pre-Construction Conference shall be held with the successful Bidder with at a minimum, representatives from the County, Contractor, selected DBE firms, GDOT Area Engineer, and the GDOT Project Manager at a time and place set by the County.

## **31. SUBSTITUTIONS**

See Special Conditions Article.

### **32. RIGHT TO PROTEST**

Any actual bidder or offeror that has submitted a bid/proposal for a particular procurement and is aggrieved in connection with the solicitation or award of the contract shall protest in writing to the purchasing agent after the date that the specific bid or proposal is submitted. No protest will be accepted or considered prior to the date the specific bid or proposal is submitted; it will be considered untimely. All protests shall set forth in full detail the factual and legal bases for the protest and specific relief sought by the protestor. Protests arising from factual or legal bases that the protestor knew or should have known prior to the submission of the bid/proposal must be submitted within three business days of the submission of the bid/proposal. Protests arising from factual or legal bases that the protestor knew or should have known subsequent to the date the bid/proposal was submitted must be submitted within ten business days after the protestor knew or should have known of such bases, but in no event shall any protest be submitted more than ten business days after the award of the contract. Untimely protests will not be considered by the purchasing agent and will be simply denied as untimely. Decisions on timeliness by the purchasing agent are not appealable. An oral protest or a protest to an official, employee, User Department, or other person apart from the Director of Purchasing & Contract Compliance does not comply.

**33. SUBMITTALS**

The following submittals must be completed and submitted with the Bid Submittal. This checklist is provided to ensure that the Bidder submits certain required information with its Bid.

	<b>Bid Submittal Check Sheet</b>	<b>Check (√)</b>
1.	<b>Georgia Security and Immigration Contractor Affidavit(s) and Agreements</b>	
2.	<b>Georgia Security and Immigration Subcontractor Affidavit(s)</b>	
3.	<b>Bid Form</b>	
4.	<b>Acknowledgment of Addenda</b>	
5.	<b>Bid Bond</b>	
6.	<b>GDOT Non-Collusion Affidavit</b>	
7.	<b>Federal Aid Certification</b>	
8.	<b>Required Contractor Provisions Federal-Aid Construction Contracts</b>	
9.	<b>Certificate of Acceptance of Request for Bid</b>	
10.	<b>Georgia Utility Contractor's License (if applicable)</b>	
11.	<b>Georgia General Contractors License (if applicable)</b>	
12.	<b>Georgia Professional License (if applicable)</b>	
13.	<b>Disclosure Form and Questionnaire</b>	
14.	<b>Disadvantage Business Enterprise (DBE) Forms (submitted in a separate envelope)</b>	
15.	<b>Proof of Insurance Coverage</b>	

**END OF SECTION**

**BID FORM**

Submitted To: Fulton County Government

Submitted By: \_\_\_\_\_

For: **15ITB062415K-DJ, BUFFINGTON ROAD UPGRADE-T188**

Submitted on \_\_\_\_\_, 20\_\_.

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Bid as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company or parties making a Bid; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Drawings and Specifications for the work and contractual documents relative thereto, and has read all instructions to Bidders and General Conditions furnished prior to the openings of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if this Bid is accepted, to contract with the Board of Commissioners of Fulton County, Atlanta, Georgia, in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary, and to complete the construction of the work in full and complete accordance with the shown, noted, and reasonably intended requirements of the Specifications and Contract Documents to the full and entire satisfaction of the Board of Commissioners of Fulton County, Atlanta, Georgia, with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents for the following prices.

THE BASE BID IS THE AMOUNT UPON WHICH THE BIDDER WILL BE FORMALLY EVALUATED AND WHICH WILL BE USED TO DETERMINE THE LOWEST RELIABLE BIDDER.

The base bid may not be withdrawn or modified for a period of sixty (60) days following the receipt of bids.

**BASE BID AMOUNT** (Do not include any Bid Alternates)

\$ \_\_\_\_\_  
**(Dollar Amount in Numbers)**

\_\_\_\_\_  
**(Dollar Amount in Words)**

The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written "Notice to Proceed" from the County.

A. The Bidder declares that he understands that the quantities shown for the unit prices items are subject to either increase or decrease, and that should the quantities of any of the items of work be increased, the Bidder proposes to do the additional work at the unit prices stated herein; and should the quantities be decreased, the Bidder also understands that payment will be made on the basis of actual quantities at the unit price bid and will make no claim for anticipated profits for any decrease in quantities; and that actual quantities will be determined upon completion of work, at which time adjustments will be made to the contract amount by direct increase or decrease.

**BASE BID AMOUNT**

B.

CONSTRUCTION ITEMS					
PAY ITEM	TOTAL QUANTITY	UNIT	DESCRIPTION	UNIT COST	TOTAL COST
150-1000	1	LS	TRAFFIC CONTROL - PI 0007096		
210-0100	1	LS	GRADING COMPLETE - PI 0007096		
310-1101	1704	TN	GR AGGR BASE CRS, INCL MATL		
402-1812	173	TN	RECYL AC LEVELING, INC BM&HL		
402-3121	767	TN	RECYL AC 25MM SP, GP1/2, BM&HL		
402-3130	1278	TN	RECYL AC 12.5MM SP, GP2, BM&HL		
402-3190	270	TN	RECYL AC 19 MM SP, GP 1 OR 2 ,INC BM&HL		
413-0750	1201	GL	TACK COAT		
432-5010	12593	SY	MILL ASPH CONC PVMT, VARB DEPTH		
441-0016	266	SY	DRIVEWAY CONCRETE, 6 IN TK		
441-0104	5892	SY	CONC SIDEWALK, 4 IN		
441-0300	2	EA	CONC SPILLWAY, SPCL DES		
441-0303	1	EA	CONC SPILLWAY, TP 3		
441-0304	1	EA	CONC SPILLWAY, TP 4		
441-0740	8	SY	CONCRETE MEDIAN, 4 IN		
441-4020	367	SY	CONC VALLEY GUTTER, 6 IN		
441-4030	35	SY	CONC VALLEY GUTTER, 8 IN		
441-6216	40	LF	CONC CURB & GUTTER/ 8X24TP2		

441-6222	9274	LF	CONC CURB & GUTTER/ 8X30TP2		
441-6740	55	LF	CONC CURB & GUTTER/ 8X30 TP7		
444-1000	6244	LF	SAWED JTS IN EXIST PVMTS - PCC		
446-1100	2006	LF	PVMT REF FAB STRIPS, TP2,18 INCH WIDTH		
500-3101	15	CY	CLASS A CONCRETE THRUST BLOCKS		
500-3800	2.23	CY	CL A CONC, INCL REINF STEEL		
500-9999	168	CY	CL B CONC,BASE OR PVMT WIDEN		
515-2015	866	LF	GALV STEEL PIPE HANDRAIL - HANDRAIL		
550-1180	2004	LF	STM DR PIPE 18,H 1-10		
550-1240	80	LF	STM DR PIPE 24,H 1-10		
550-4118	2	EA	FLARED END SECT 18 IN, SIDE DR		
550-4218	6	EA	FLARED END SECT 18 IN, ST DR		
550-4224	3	EA	FLARED END SECT 24 IN, ST DR		
603-1012	61	SY	STN PLAIN RIP RAP, 12 IN		
603-1018	35	SY	STN PLAIN RIP RAP, 18 IN		
603-7000	95	SY	PLASTIC FILTER FABRIC		
610-6515	12	EA	REM HIGHWAY SIGN, STD		
611-3000	1	EA	RECONSTR CATCH BASIN, GROUP 1		
611-5360	12	EA	RESET HIGHWAY SIGN		
634-1200	109	EA	RIGHT OF WAY MARKERS		
636-1020	143	SF	HWY SGN,TP1MAT,REFL SH TP3		

636-1029	186	SF	HWY SGN,TP2 MATL,REFL SH TP 3		
636-1033	231	SF	HWY SIGNS, TP1MAT,REFL SH TP 9		
636-2070	586	LF	GALV STEEL POSTS, TP 7		
636-4104	12	EA	PLASTIC FLEXIBLE DELINEATOR, TP 2B		
641-1100	280	LF	GUARDRAIL, TP T		
641-1200	1252	LF	GUARDRAIL, TP W		
641-5001	5	EA	GUARDRAIL ANCHORAGE, TP 1		
641-5006	4	EA	GUARDRAIL ANCHORAGE, TP 6		
641-5012	4	EA	GUARDRAIL ANCHORAGE, TP 12		
643-8200	350	LF	BARRIER FENCE (ORANGE), 4 FT		
653-0100	4	EA	THERM PVMT MARK, RR/HWY X SYM		
653-0110	2	EA	THERM PVMT MARK, ARROW, TP 1		
653-0120	37	EA	THERM PVMT MARK, ARROW, TP 2		
653-0130	4	EA	THERM PVMT MARK, ARROW, TP 3		
653-0150	2	EA	THERM PVMT MARK, ARROW, TP 5		
653-0210	10	EA	THERM PVMT MARK, WORD , TP 1		
653-1501	2435	LF	THERMO SOLID TRAF ST 5 IN, WHI		
653-1502	7745	LF	THERMO SOLID TRAF ST, 5 IN YEL		
653-1704	441	LF	THERM SOLID TRAF STRIPE,24,WH		
653-1804	4836	LF	THERM SOLID TRAF STRIPE, 8,WH		
653-3501	1295	GLF	THERMO SKIP TRAF ST, 5 IN, WHI		

653-6004	76	SY	THERM TRAF STRIPING, WHITE		
<b>653-6006</b>	1303	SY	THERM TRAF STRIPING, YELLOW		
654-1001	90	EA	RAISED PVMT MARKERS TP 1		
654-1003	95	EA	RAISED PVMT MARKERS TP 3		
668-1100	20	EA	CATCH BASIN, GP 1		
668-2200	1	EA	DROP INLET, GP 2		
668-4300	1	EA	STORM SEW MANHOLE, TP 1		
668-5000	1	EA	JUNCTION BOX		
668-7018	2	EA	DRAIN INLET, 18 IN		
682-9950	25	LF	DIRECTIONAL BORE – 5" BORE		
682-9950	720	LF	DIRECTIONAL BORE - 7" BORE		
700-6910	3	AC	PERMANENT GRASSING		
700-7000	8	TN	AGRICULTURAL LIME		
700-8000	3	TN	FERTILIZER MIXED GRADE		
700-8100	141	LB	FERTILIZER NITROGEN CONTENT		
<b>WATER ITEMS</b>					
611-8010	4	EA	ADJUST HYDRANT TO GRADE		
611-8140	16	EA	ADJUST WATER VALVE BX TO GRADE		
611-8055	1	EA	ADJUST MINOR STRUCT TO GRADE (2 IN METER VAULT)		
611-8120	8	EA	ADJUST WATER METER BX TO GRADE		
670-1060	28	LF	WATER MAIN, 6 IN (DUCTILE IRON PIPE)		

670-1080	100	LF	WATER MAIN, 8 IN (DUCTILE IRON PIPE)		
670-4000	4	EA	FIRE HYDRANT		
670-5020	50	LF	WATER SERVICE LINE, 2 IN (COPPER)		
670-9730	6	EA	RELOCATE X WATER METER, INC BOX		
670-9920	3	EA	REMOVE EXIST FIRE HYDRANT		
670-5620	255	LF	WATER SERVICE LINE, 3/4 IN (COPPER)		
670-5015	10	LF	WATER SERVICE LINE, 1 1/2" (COPPER)		
670-5040	40	LF	WATER SERVICE LINE, 4 IN (DUCTILE IRON PIPE)		
670-9736	2	EA	RLC EX WTR MTR INC BP&VLT, LT4"		
670-9737	2	EA	RLC EXT WT MT, INC BP&VLT, 4"GT		
<b>SIGNAL ITEMS</b>					
639-3004	1	EA	STEEL STRAIN POLE, TP IV W/ 30' MAST ARM		
639-3004	1	EA	STEEL STRAIN POLE, TP IV W/ 35' MAST ARM		
639-3004	3	EA	STEEL STRAIN POLE, TP IV W/ 40' MAST ARM		
639-3004	2	EA	STEEL STRAIN POLE, TP IV W/ 45' MAST ARM		
639-3004	1	EA	STEEL STRAIN POLE, TP IV W/ 55' MAST ARM		
639-3004	1	EA	STEEL STRAIN POLE, TP IV W/ 60' MAST ARM		
639-3004	1	EA	STEEL STRAIN POLE, TP IV W/ 50' AND 60' MAST ARMS		
647-1000	1	LS	TRAF SIGNAL INSTALLATION NO - INST. NO. 1		
647-1000	1	LS	TRAF SIGNAL INSTALLATION NO - INST. NO. 2		

647-1000	1	LS	TRAF SIGNAL INSTALLATION NO - INST. NO. 3		
682-6222	50	LF	CONDUIT, NONMETL, TP 2, 2 IN		
682-6233	2160	LF	CONDUIT, NONMETL, TP 3, 2 IN		
935-6562	3	EA	EXT TRNSCVR, DRP&RPT, 1310SM,(SIGNAL JOBS)		
937-6050	15	EA	INT VIDEO DET SYS ASMBLY, TP A		
937-6150	3	EA	PROGRAMMING MONITOR, TP A		
<b>EROSION CONTROL ITEMS</b>					
163-0232	1.5	AC	TEMPORARY GRASSING		
163-0240	46	TN	MULCH		
163-0300	8	EA	CONSTRUCTION EXIT		
163-0503	16	EA	CONSTR AND REMOVE SILT CONTROL GATE,TP 3		
163-0527	40	EA	CONSTR AND REM RIP RAP CK DAMS, STONE RIP RAP/SAND BAGS		
163-0550	32	EA	CONS & REM INLET SEDIMENT TRAP		
165-0010	5532	LF	MAINT OF TEMP SILT FENCE, TP A		
165-0041	400	LF	MAINT OF CHECK DAMS - ALL TYPES		
165-0087	16	EA	MAINT OF SILT CONTROL GATE, TP 3		
165-0101	16	EA	MAINT OF CONST EXIT		
165-0105	32	EA	MAINT OF INLET SEDIMENT TRAP		
167-1000	3	EA	WATER QUALITY MONITORING AND SAMPLING		
167-1500	12	MO	WATER QUALITY INSPECTIONS		

171-0010	11063	LF	TEMPORARY SILT FENCE, TYPE A		
716-2000	6188	SY	EROSION CONTROL MATS, SLOPES		
<b>BASE BID AMOUNT</b>					
	1	LUMP	CSXT CONSTRUCTION AGREEMENT	\$ 421,869.00	\$ 421,869.00
	1	LUMP	AT&T RELOCATIONS	\$ 68,866.00	\$ 68,866.00
	1	LUMP	GEORGIA POWER UTILITY RELOCATIONS	\$ 366,742.00	\$ 366,742.00
	1	LUMP	POST DESIGN SERVICES	\$ 40,000.00	\$ 40,000.00
	1	LUMP	TESTING ALLOWANCES	\$ 20,000.00	\$ 20,000.00
	1	LUMP	CONSTRUCTION INSPECTION	\$ 100,000.00	\$ 100,000.00
<b>OWNER CONTROLLED CONTINGENCY AMOUNT</b>					\$ 125,000.00
<b>TOTAL BID</b>					

C. The Bidder furthermore agrees that, in the case of a failure on his part to execute the Contract Agreement and Bonds within ten days after receipt of conformed contract documents for execution, the Bid Bond accompanying his bid and the monies payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure.

Enclosed is a Bid Bond in the approved form, in the sum of:

\_\_\_\_\_ Dollars

D. (\$ \_\_\_\_\_) according to the conditions of "Instructions to Bidders" and provisions thereof.

E. The undersigned acknowledges receipt of the following addenda (list by the number and date appearing on each addendum) and thereby affirms that its Bid considers and incorporates any modifications to the originally issued Bidding Documents included therein.

ADDENDUM # \_\_\_\_\_ DATED \_\_\_\_\_  
 ADDENDUM # \_\_\_\_\_ DATED \_\_\_\_\_  
 ADDENDUM # \_\_\_\_\_ DATED \_\_\_\_\_

ADDENDUM # \_\_\_\_\_

DATED \_\_\_\_\_

**BIDDER:** \_\_\_\_\_

Signed by: \_\_\_\_\_  
[Type or Print Name]

Title: \_\_\_\_\_

Business Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Business Phone: \_\_\_\_\_

Note: If the Bidder is a corporation, the Bid shall be signed by an officer of the corporation; if a partnership, it shall be signed by a partner. If signed by others, authority for signature shall be attached.

The full name and addresses of persons or parties interested in the foregoing Bid, as principals, are as follows:

Name	Address
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**END OF SECTION**

## BID BOND

No bid for a contract in Fulton County for work to be done shall be valid for any purpose unless the Contractor shall give a Bid Bond with good and sufficient surety payable to, in favor of, and for the protection of Fulton County. The Bid Bond shall not be less than 5% of the total amount payable by the terms of the Contract. No bid shall be read aloud or considered if a proper bid bond has not been submitted.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

**BID BOND**  
**15ITB062415K-DJ, BUFFINGTON ROAD UPGRADE-T188**  
**FULTON COUNTY GOVERNMENT**

KNOW ALL MEN BY THESE PRESENTS, THAT WE \_\_\_\_\_

\_\_\_\_\_ hereinafter called the PRINCIPAL, and \_\_\_\_\_

\_\_\_\_\_ hereinafter call the SURETY, a corporation chartered and existing under the laws of the State of \_\_\_\_\_ and duly authorized to transact Surety business in the State of Georgia, are held and firmly bound unto the Fulton County Government (COUNTY), in the penal sum of \_\_\_\_\_ Dollars and Cents (\$ \_\_\_\_\_) good and lawful money of the United States of America, to be paid upon demand of the COUNTY, to which payment well and truly to be made we bind ourselves, our heirs, executors, and administrators and assigns, jointly and severally and firmly by these presents.

WHEREAS the PRINCIPAL has submitted to the COUNTY, for 15062415K-DJ, BUFFINGTON ROAD UPGRADE-T188, a Bid;

WHEREAS the PRINCIPAL desires to file this Bond in accordance with law:

NOW THEREFORE: The conditions of this obligation are such that if the Bid be accepted, the PRINCIPAL shall within ten (10) calendar days after receipt of written notification from the COUNTY of the award of the Contract execute the Contract in accordance with the Bid and upon the terms, conditions and prices set forth therein, in the form and manner required by the COUNTY, and execute sufficient and satisfactory Performance and Payments Bonds payable to the COUNTY, each in the amount of one hundred percent (100%) of the total contract price, in form and with security satisfactory to said COUNTY, then this obligation to be void; otherwise, to be and remain in full force and virtue in law; and the SURETY shall upon failure of the PRINCIPAL to comply with any or all of the foregoing requirements within the time specified above immediately pay to the COUNTY, upon demand the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

In the event suit is brought upon this Bond by the COUNTY and judgment is recovered, the SURETY shall pay all costs incurred by the COUNTY in such suit, including attorney's fees to be fixed by the Court.

Enclosed is a Bid Bond in the approved form, in the amount of \_\_\_\_\_  
\_\_\_\_\_ Dollars  
(\$ \_\_\_\_\_) being in the amount of five percent (5%) of the Contract Sum.  
The money payable on this bond shall be paid to the COUNTY, for the failure of the Bidder to  
execute a Contract within ten (10) days after receipt of the Contract and at the same time furnish  
a Payment Bond and Performance Bond.

(SIGNATURES ON NEXT PAGE)

IN TESTIMONY THEREOF, the PRINCIPAL and SURETY have caused these presents to be duly signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

ATTEST:

\_\_\_\_\_  
PRINCIPAL

\_\_\_\_\_  
BY \_\_\_\_\_

(SEAL)

**CERTIFICATE AS TO CORPORATE PRINCIPAL**

I, \_\_\_\_\_, certify that I am the Secretary of the Corporation named as principal in the within bond; that \_\_\_\_\_, who signed the said bond of said corporation; that I know this signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed and attested for in behalf of said Corporation by authority of its governing body.

\_\_\_\_\_  
SECRETARY

(CORPORATE SEAL)

\_\_\_\_\_  
SURETY

\_\_\_\_\_  
BY \_\_\_\_\_

(SEAL)

**END OF SECTION**

### **PAYMENT BOND**

No Contract with Fulton County for work to be done shall be valid for any purpose unless the Contractor provides a Payment Bond with good and sufficient surety payable to Fulton County for the use and protection of all sub-contractors and all persons supplying labor, materials, machinery, and equipment in the prosecution of the work provided for in the Contract. The Payment Bond shall be in the amount of 110% of the total contract amount, payable by the terms of the Contract, and shall be written on the following form.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State of Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

### PAYMENT BOND

**KNOW ALL MEN BY THESE PRESENTS** that \_\_\_\_\_  
(hereinafter called the "Principal") and \_\_\_\_\_  
(hereinafter called the "Surety"), are held and firmly bound unto **FULTON COUNTY**, a political subdivision of the State of Georgia (hereinafter called the "Owner"), its successors and assigns as obligee, in the penal sum of \_\_\_\_\_ **110% of Contract amount**, lawful money of the United States of America, for the payment of which the Principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, the Principal has entered, or is about to enter, into a certain written contract with the Owner, dated \_\_\_\_\_, which is incorporated herein by reference in its entirety (hereinafter called the "Contract"), for construction-type services of a project known as **15062415K-DJ, Buffington Road Upgrade-T188**, as more particularly described in the Contract (hereinafter called the "Project");

**NOW, THEREFORE**, the condition of this obligation is such that if the Principal shall promptly make payment to all persons working on or supplying labor or materials under the Contract, and any amendments thereto, with regard to labor or materials furnished and used in the Project, and with regard to labor or materials furnished but not so used, then this obligation shall be void; but otherwise it shall remain in full force and effect.

1. A "Claimant" shall be defined herein as any subcontractor, person, party, partnership, corporation or the entity furnishing labor, services or materials used, or reasonably required for use, in the performance of the Contract, without regard to whether such labor, services or materials were sold, leased or rented, and without regard to whether such Claimant is or is not in privity of contract with the Principal or any subcontractor performing work on the Project, including, but not limited to, the following labor, services, or materials: water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
2. In the event a Claimant files a lien against the property of the Owner, and the Principal fails or refuses to satisfy or remove it promptly, the Surety shall satisfy or remove the lien promptly upon written notice from the Owner, either by bond or as otherwise provided in the Contract.
3. The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in the payment terms, and any other amendments in or about the Contract and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and amendments.
4. The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto, upon any amendment or modifications to the Contract, so as to bind the Principal and Surety, jointly and severally, to the full payment of any Claimant under the Contract, as amended or modified, provided only that the Surety shall not be liable for more than the penal sum of the Bond, as specified in the first paragraph hereof.
5. This Bond is made for the use and benefit of all persons, firms, and corporations who or which may furnish any materials or perform any labor for or on account of the

construction-type services to be performed or supplied under the Contract, and any amendments thereto, and they and each of them may sue hereon.

6. No action may be maintained on this Bond after one (1) year from the date the last services, labor, or materials were provided under the Contract by the Claimant prosecuting said action.
7. This Bond is intended to comply with O.C.G.A. Section 13-10-1, and shall be interpreted so as to comply with the minimum requirements thereof. However, in the event the express language of this Bond extends protection to the Owner beyond that contemplated by O.C.G.A. Section 13-10-1, or any other statutory law applicable to this Project, then the additional protection shall be enforced in favor of the Owner, whether or not such protection is found in the applicable statutes.

**IN WITNESS WHEREOF** the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representatives this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
(Principal) (SEAL)

By: \_\_\_\_\_

Attest:

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
(Surety) (SEAL)

By: \_\_\_\_\_

Attest:

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
(Address of Surety's Home Office)

\_\_\_\_\_  
(Resident Agent of Surety)

### PERFORMANCE BOND

No contract with Fulton County for work to be done shall be valid for any purpose unless the Contractor provides a Performance Bond with good and sufficient surety payable to, in favor of, and for the protection of Fulton County. The Performance Bond shall be in the amount of 100% of the total contract amount, payable by the terms of the Contract, and shall be written on the following form.

Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business as a surety in Georgia.

Attestation for the corporation must be by the corporate officer; for a partnership by another partner; for an individual by a notary with the corporate seal.

## PERFORMANCE BOND

**KNOW ALL MEN BY THESE PRESENTS** that \_\_\_\_\_  
(hereinafter called the "Principal") and \_\_\_\_\_  
(hereinafter called the "Surety"), are held and firmly bound unto **FULTON COUNTY**, a political subdivision of the State of Georgia (hereinafter called the "Owner"), its successors and assigns, in the penal sum of \_\_\_\_\_ **100% of Contract amount**, lawful money of the United States of America, for the payment of which the Principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, the Principal has entered, or is about to enter, into a certain written contract with the Owner, dated \_\_\_\_\_, which is incorporated herein by reference in its entirety (hereinafter called the "Contract"), for construction-type services of a project known as **15062415K-DJ, Buffington Road Upgrade-T188**, as more particularly described in the Contract (hereinafter called the "Project");

**NOW, THEREFORE**, the conditions of this obligation are as follows, that if the Principal shall fully and completely perform all the undertakings, covenants, terms, conditions, warranties, and guarantees contained in the Contract, including all modifications, amendments, changes, deletions, additions, and alterations thereto that may hereafter be made, then this obligation shall be void; otherwise it shall remain in full force and effect.

Whenever the Principal shall be, and declared by the Owner to be, in default under the Construction-Type Contract, the Surety shall promptly remedy the default as follows:

1. Complete the Contract in accordance with its terms and conditions; or, at the sole option of the Owner,
2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the Surety and the Owner of the lowest responsible bidder, arrange for a contract between such bidder and Owner and make available as the work progresses (even though there should be a default or succession of defaults under the Contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the penal sum set forth in the first paragraph hereof, as may be adjusted, and the Surety shall make available and pay to the Owner the funds required by this Paragraph prior to the payment of the Owner of the balance of the contract price, or any portion thereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the Owner to the Contractor under the Contract, and any amendments thereto, less the amount paid by the Owner to the Contractor; or, at the sole option of the Owner,
3. Allow Owner to complete the work and reimburse the Owner for all reasonable costs incurred in completing the work.

In addition to performing as required in the above paragraphs, the Surety shall indemnify and hold harmless the Owner from any and all losses, liability and damages, claims, judgments, liens, costs and fees of every description, including reasonable attorney's fees, litigation costs and expert witness fees, which the Owner may incur, sustain or suffer by reason of the failure or default on the part of the Principal in the performance of any or all of the terms, provisions, and requirements of the Contract, including any and all amendments and modifications thereto, or

incurred by the Owner in making good any such failure of performance on the part of the Principal.

The Surety shall commence performance of its obligations and undertakings under this Bond promptly and without delay, after written notice from the Owner to the Surety.

The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and any other amendments in or about the Contract, and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, change in payment terms, and amendments.

The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto, upon any amendment to the Contract, so as to bind the Principal and the Surety to the full and faithful performance of the Contract as so amended or modified, and so as to increase the penal sum to the adjusted Contract Price of the Contract.

No right of action shall accrue on this Bond to or for the use of any person, entity or corporation other than the Owner and any other obligee named herein, or their executors, administrators, successors or assigns.

This Bond is intended to comply with O.C.G.A. Section 36-91-1 et seq., and shall be interpreted so; as to comply with; the minimum requirements thereof. However, in the event the express language of this Bond extends protection to; the Owner beyond that contemplated by O.C.G.A. Section 36-91-1 et seq. and O.C.G.A. Section 13-10-1, as amended, or any other statutory law applicable to this Project, then the additional protection shall be enforced in favor of the Owner, whether or not such protection is found in the applicable statutes.

**IN WITNESS WHEREOF** the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representatives this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
(Principal) (SEAL)

By: \_\_\_\_\_

Attest:

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
(Surety) (SEAL)

By: \_\_\_\_\_

Attest:

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
(Address of Surety's Home Office)

\_\_\_\_\_  
(Resident Agent of Surety)

**END OF SECTION**

## SECTION 5

### SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

The Scope of Work and Technical Specifications for this project consists of two 12-foot lane upgrade with 5-foot wide sidewalks on the east side and 5 to 6-foot wide sidewalks on the west side as fully described in the project design plans. The project extends along Buffington Road from Royal South Parkway to Roosevelt Highway for a distance of 1.85 miles.

Bid Specifications may be found in the Bid Plans, which may be accessed in the Fulton County Purchasing Department's Plan room or from Action Blueprint. (See the "Invitation to Bid" for details on how to secure a copy of the Bid Plans.)

- Plan sheets 30, 31, 33, and 34 indicates improvements within a clouded area.

However, the clouded area will be work "Done by Others". The work in this area may be complete prior to construction of this project.

The construction of this project is federally funded and shall comply with all federal requirements. The proposed project consists of the following major elements: the addition of curb and gutter, a 2-foot wide grass strip and turning lanes at intersections located at the Vulcan plant, the Coca Cola plant, South Fulton Parkway Spur ramps and Roosevelt Highway. Signal modifications along Buffington Road at Sable Run Road, Naturally Fresh Blvd. and Roosevelt Highway will also be included. As a result of the construction, various water line adjustments will be required. All other required utility relocations will be handled by the respective utility owner.

**TECHNICAL SPECIFICATIONS**

**PI 0007096**

**BUFFINGTON ROAD IMPROVEMENTS**

**SECTION 01040  
COORDINATION**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Coordinate execution of the Work with subcontractors and the Engineer as required to maintain operation of the existing facilities and satisfactory progress of the Work.
- B. The Engineer may require a written explanation of the Contractor's plan for accomplishing separate phases of the Work.

**PART 2 PRODUCTS**

(NOT USED)

**PART 3 EXECUTION**

**3.01 CUTTING AND PATCHING**

- A. Carefully fit around, close up, repair, patch, and point around the work specified herein to the satisfaction of the Engineer.
- B. Do not cut or alter the work of any subcontractor, except with the written consent of the subcontractor whose work is to be cut or altered, or with the written consent of the Engineer. All cutting and patching or repairing made necessary by the negligence, carelessness or incompetence of the Contractor or any of its subcontractors, shall be done by, or at the expense of, the Contractor and shall be the responsibility of the Contractor.

**3.02 COORDINATION**

- A. The Contractor shall consult with the Engineer on a daily basis while performing demolition, excavation, or any other alteration activity. No water or sewer function, utility or structure shall be altered, shut off or removed unless approved in advance, and in writing, by the Engineer. The Contractor shall give the Engineer at least 48 hours advanced notice, in writing, of the need to alter, shut off or remove such function.
- B. Coordinate the Work with the Engineer and revise daily activities if needed so as to not adversely affect system operations. Such revisions in the proposed work schedule will be accomplished with no additional compensation to the Contractor.

**3.03 OWNER'S RESPONSIBILITIES**

- A. All existing water system valves shall be located, uncovered as necessary and operated by the Owner.

**3.04 PROTECTION AND RESTORATION OF WORK AREA**

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is completed.
  - 1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
  - 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
  - 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
  - 4. The Engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.
- B. Man-made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the Work.
- C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Engineer. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.
- F. Swamps and Other Wetlands
  - 1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
  - 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.

3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

### **3.05 WATER FOR CONSTRUCTION PURPOSES**

- A. All water required for construction shall be furnished by the Owner. It shall be available by connecting to the Owner's water system at a point approved by the Engineer. There shall be installed in every connection to the Owner's water supply, a water meter with backflow preventer meeting the requirements of the City. The Contractor shall meter all water usage. The Contractor shall notify the City through coordination and written correspondence with the County one week in advance prior to connecting to the water system.
- B. A total of the metered water used shall be submitted to the Engineer with each monthly application for payment

### **3.06 EXISTING UTILITIES AND OBSTRUCTIONS**

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available. The Contractor shall call the Utilities Protection Center (UPC) (800-282-7411) as required by Georgia Law (O.C.G.A. Sections 25-9-1 through 25-9-13) and shall call all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.
- B. Existing Utility Locations: The following steps shall be exercised to avoid interruption of existing utility service.
  1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure at the time of any excavation that a valid utility location exists at the point of excavation.
  2. Expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
  3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
  4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly, or more frequently if required.
- C. Conflict with Existing Utilities
  1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation

of the water main by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the Engineer. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the Engineer. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

D. Electronic Locator: The Contractor shall have available, at all times, an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Sewer Separation

1. Water mains should maintain a minimum 10 foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10 foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18-inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18-inches.
2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete thickness to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.
3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

F. Work shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures, utilities or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor for laying and joining different or additional items where required or when directed by the Engineer.

### **3.07 PIPE DISTRIBUTION**

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. Distribution and stringing of pipe along the route will be limited to the total length which will be installed in one work day/work shift. The Owner reserves the right to reduce the distance in residential and commercial areas based on the effects of the pipe distribution on the adjacent property owners.

- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

**3.08 CONSTRUCTION OPERATIONS**

- A. Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
- B. Construction operations shall be limited to 400 feet along the water main route, including clean-up and utility exploration.
- C. The Contractor shall insure that all work areas and roadways are free from excess excavated material, debris, mud, soil, rocks etc. at the end of each work day. Contractor shall be responsible for sweeping all areas at the end of each work day.

**3.09 CONNECTIONS TO WORK BY OTHERS**

- A. As shown on the Drawings, pipelines constructed under this Contract are to be connected to pipelines to be constructed by others.

+++ END OF SECTION 01040 +++

**SECTION 01055  
CONSTRUCTION STAKING**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Construction staking shall include all of the surveying work required to layout the Work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as ordered by the Engineer.
- B. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- C. Work under this Section also includes surveying work required to prepare Record Drawings as specified herein.

**1.02 QUALITY ASSURANCE**

- A. The Contractor shall hire, at the Contractor's own expense, a Surveyor with current registration in the State of Georgia, acceptable to the Owner, to provide project construction staking and confirmation of the vertical and horizontal alignment.
- B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.

**1.03 SUBMITTALS**

- A. Submit name and address of Registered Surveyor to Engineer.
- B. On request of Engineer, submit documentation to verify accuracy of construction staking.
- C. Submit record drawings in accordance with PART 3 of the Section.

**PART 2 PRODUCTS**

**(NOT USED)**

**PART 3 EXECUTION**

**3.01 PROJECT CONDITIONS**

- A. The Drawings provide the location of principal components of the Project. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.
- B. The Engineer will provide the following:
  - 1. One vertical control point on the Project site with its elevation shown on the Drawings.

2. A minimum of two horizontal control points on the Project site with their coordinates shown on the Drawings.

### 3.02 GENERAL

- A. From the information shown on the Drawings and the information to be provided as indicated in paragraph 3.01 above, the Contractor shall:
  1. Be responsible for establishing GPS control coordinate control system, setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.
    - a. The horizontal position of all points shall be referenced to the North American datum of 1983 (1986 adjustment) in the Georgia State Plane West 1002 Coordinate System.
    - b. The vertical position of all points shall be referenced to the North American Vertical datum of 1988.
    - c. All coordinate values shall be delivered as grid coordinates in US Survey Feet.
    - d. The minimum data accuracy required for all record drawings shall be +/- 0.10 USFT (one tenth of one foot).
  2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
  3. Stake out the limits of construction to ensure that the Work does not deviate from the indicated limits.
  4. Stake out the pipeline horizontal and vertical alignment.
  5. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
  6. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. Baselines shall be defined as the line to which the location of the Work is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line.

### 3.03 STAKING PRECISION

- A. The precision of construction staking shall match the precision of components location indicated on the Drawings. Staking of utilities shall be done in accordance with standard accepted practice for the type of utility.
- B. The precision of construction staking required shall be such that the location of the water main or sewer or storm drain can be established for construction and verified by the Engineer. Where the location of components of the water main or sewer or storm drain, ( i.e. fittings, valves, manholes, road crossings, etc.) are not dimensioned, the establishment of the location of these components

shall be based upon scaling these locations from the Drawings with relation to readily identifiable land marks, i.e. survey reference points, power poles, manholes etc.

- C. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with grades shown on the Drawings shall be identified by the Contractor and confirmed by the Engineer prior to constructing the base.
- D. The Contractor's attention is directed to Section 01040, Paragraph 3.06.

### **3.04 RECORD DRAWINGS**

#### **A. Water Mains**

1. The Contractor shall submit record drawings which show the final installed location of the water main and survey data for all installed pipe, valves and fittings, tunnel and casing limits and service connections 3-inches in diameter and greater. Survey data shall consist of final coordinates for all valves, fittings, tunnel and casing limits and main tap locations for service connections 3-inches in diameter and greater and center line of pipe at points every 500 feet along the length of pipe installed.
2. In addition, the location of all valves and fittings and main tap location for service connections 3-inches in diameter and greater shall be indicated by at least 2 ties (measured distances) from permanent fixed objects within the public right of way, as accepted by the Engineer, to allow the Owner to locate the water main and components in the future without the use of GPS instruments.

#### **B. (Not Used)**

- C. The record drawings shall also indicate the horizontal and vertical location, dimensions and materials of all utilities encountered during excavation.
- D. Record drawings must be georeferenced to the U.S. State Plane Coordinate System, NAD 83 GA West Zone, US Survey Feet. All drawings must contain two reference pins which are labeled and tied to the Fulton County GPS Monument Network.
- E. Two full size hard copies of record drawings shall be furnished to the Engineer for review. Each record drawing shall be stamped with the name of the Contractor, signed and dated by the Contractor's Project Manager and signed, sealed and dated by the Surveyor. Record Drawings, once approved by the Engineer, shall be scanned and saved as PDF's.
- F. The contractor shall provide an electronic copy of the record drawings in AutoCAD Civil 3D 2011 (.DWG) format.
- G. Final submittal of record drawings shall be provided by two compact disks containing the signed and sealed PDF's and DWG files referenced above.

**+++ END OF SECTION 01055 +++**

**SECTION 01320  
CONSTRUCTION PHOTOGRAPHY**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. The Contractor shall furnish all labor, equipment and materials required to provide the Owner with digital construction photography of the Project as specified herein.
- B. The Contractor shall provide for professional videos and photographs to be made prior to and after construction to provide documentation of conditions and aid in any damage claims assessment. All conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions.
- C. Video and photo files shall become the property of the Owner and none of the video or photographs herein shall be published without express permission of the Owner.

**1.02 PRE AND POST CONSTRUCTION PHOTOGRAPHY**

- A. Prior to the beginning of any work, the Contractor shall provide for professional videos and photographs of the work area to record existing conditions.
  - 1. The Contractor shall furnish a complete videotaped record of the pipeline route. The video tape shall include the date of taping and shall contain audio commentary to emphasize existing conditions along the entire route.
  - 2. The route shall be videotaped prior to beginning of construction. The Contractor shall furnish three sets of compact disks containing the videotaped data to the Engineer.
  - 3. The route shall also be videotaped at the completion of construction when directed by the Engineer. The video tape shall show the same areas and features as in the preconstruction videos. The Contractor shall furnish three sets of compact discs containing the videotaped data to the Engineer.
- B. The pre-construction videos shall be submitted to the Engineer within 15 calendar days after receipt of construction Notice to Proceed by the Contractor. Post construction videos and photographs shall be provided prior to final acceptance of the project.

**1.03 PROGRESS PHOTOGRAPHS**

- A. Photographs shall be taken to record the general progress of the Project during each pay period. Photographs shall be representative of the primary work being performed at the time.
- B. All photographs shall be taken with a digital camera. The photographs shall include the date and time marking in the digital record. All photographs shall be labeled on a tab connected to the bottom of the photo to indicate date and description of work shown.

**PART 2 PRODUCTS**

**2.01 PHOTOGRAPHS**

- A. Photography and video files shall be provided in CD-ROM format.
- B. Photographs shall also be provided in hard copy format. The photographs shall include the date and time marking on the photograph. All photographs shall be labeled on a tab connected to the bottom of the photograph. Tab label shall contain:
  - 1. Project name.
  - 2. Orientation of view.
  - 3. Description of work shown.
- C. All compact disks (CDs) furnished under this section shall be suitable for viewing with Windows Media Player.

### **PART 3 EXECUTION**

#### **3.01 SUBMITTALS**

- A. No construction shall start until pre-construction photography has been completed and accepted by the Engineer.
- B. A minimum of ten 8 x10-inch progress photographs shall be submitted with each application for payment. The view selection will be as determined by the Engineer. Photographs shall be submitted in Print File Archival Preservers, 8 1/2 x 11-inch plastic sleeves pre-punched for a 3-ring binder.
- C. Construction photographs shall be submitted with each payment request. Failure to include photographs may be cause for rejection of the payment request.
- D. The Contractor shall be responsible for all discrepancies not documented in the pre-construction videos and photography.

**+++ END OF SECTION 01320 +++**

**SECTION 01610  
TRANSPORTATION AND HANDLING**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. The Contractor shall provide transportation of all equipment, materials and products furnished under these Contract Documents to the Work site. In addition, the Contractor shall provide preparation for shipment, loading, unloading, handling and preparation for installation and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the Work.
- B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the County prior to being incorporated into the Work.

**1.02 TRANSPORTATION**

- A. All equipment shall be suitably boxed, crated or otherwise protected during transportation.
- B. Where equipment will be installed using existing cranes or hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment.
- C. Small items and appurtenances such as gauges, valves, switches, instruments and probes which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

**1.03 HANDLING**

- A. All equipment, materials and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.
- D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

**PART 2 PRODUCTS**

**(NOT USED)**

**PART 3 EXECUTION**

**(NOT USED)**

**+++ END OF SECTION 01610 +++**

**SECTION 02150  
SHEETING, SHORING AND BRACING**

**PART I GENERAL**

**1.01 SCOPE**

- A. This section specifies requirements for sheeting, shoring, and bracing of trenches and excavations greater than 5-feet in depth. Where shoring, sheeting, bracing or other supports are necessary, they shall be furnished, placed, maintained, and except as specified otherwise, removed by the Contractor.
- B. Design Requirements:
1. The design, planning, installation and removal, if required, of all sheeting, shoring, lagging, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.
  2. The Contractor shall design sheeting, shoring, and bracing in accordance with the OSHA Safety and Health Standards as well as state and local requirements.
  3. Horizontal strutting below the barrel of a pipe and the use of pipe as support are not acceptable.
  4. When the construction sequence of structures requires the transfer of bracing to the completed portions of any new structure or to any existing structure, the Contractor shall provide the Engineer with a complete design analysis of the expected impact of that bracing on the structure. This action shall in no way absolve the Contractor of responsibility of damage resulting from said bracing.

**1.02 REFERENCES**

- A. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
OSHA 2207	OSHA Safety and Health Standards, Revised 1987

**1.03 SUBMITTALS**

- A. Prior to starting any excavation work requiring sheeting, shoring, and bracing, the Contractor shall submit his plans for trench and excavation support systems to the Engineer as working drawings in accordance with the requirements of the General Conditions. No provisions of the above requirements shall be construed as relieving the Contractor of his overall responsibility and liability for the work.
- B. The Contractor shall submit a Certification of Compliance properly identified with the project name and project location. The Certification shall state that the sheeting, shoring and bracing

have been designed in accordance with the prevailing codes and standards by a Professional Engineer registered in the State of Georgia with the Engineer's seal and signature appearing on the certification. Calculations shall not be submitted unless specifically requested by the Engineer.

**PART 2 PRODUCTS**

**(NOT USED)**

**PART 3 EXECUTION**

**3.01 GENERAL**

- A. The construction of sheeting, shoring and bracing shall not disturb the state of soil adjacent to the trench and below the excavation bottom.
- B. Trench sheeting below the top of a pipe shall be left in place.
- C. Excavation shall not be started until the design for support systems has been accepted by the Engineer.

**+++ END OF SECTION 02150 +++**

**SECTION 02225  
TRENCH EXCAVATION AND BACKFILL**

**PART I GENERAL**

**1.01 SCOPE**

- A. The Contractor shall furnish all labor, materials, equipment, and incidentals required to perform all excavation and backfill required to complete the work as shown on the Drawings and as specified herein. The work shall include, but not be necessarily limited to, excavation and backfill for pipe and appurtenances, manholes and vaults, backfill and compaction, disposal of surplus and unsuitable material and all related work such as sheeting and bracing and dewatering.
- B. Work shall also include the removal of trees, stumps, brush, debris or other obstacles which remain after clearing and grubbing operations, which may obstruct the work, and the removal of all other materials, including rock, to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the Drawings and as specified herein.
- C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface.
- D. The trench is divided into five specific areas:
  - 1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization.
  - 2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.
  - 3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.
  - 4. Initial Backfill: The area above the haunching material and below a plane 12-inches above the top of the barrel of the pipe.
  - 5. Final Backfill: The area above a plane 12-inches above the top of the barrel of the pipe.
- E. The choice of method, means, techniques, and equipment rests with the Contractor. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the: type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected and available easement or right of way.

**1.02 QUALITY ASSURANCE**

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or specified herein.
  - 1. ASTM C33 – Standard Specification for Concrete Aggregates
  - 2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

3. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>)
  4. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using A Vibratory Table
  5. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
  6. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
  7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>)
  8. ASTM D2937 – Standard Method for Density of Soil in Place by the Drive-Cylinder Method
- B. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D698, except that for cohesionless, free draining soils "maximum dry density" shall mean the maximum index density as determined by ASTM D4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D1556, ASTM D6938 or ASTM D2937.
- C. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory.

### **1.03 SUBMITTALS**

- A. The Contractor shall submit record documents in accordance with the requirements of the General Conditions. The Contractor shall record locations of all pipelines installed referenced to survey benchmarks. The Contractor shall also include the locations of all underground utilities encountered and/or rerouted. The Contractor shall provide dimensions, materials, elevations, inverts and direction of flow. The Contractor shall use GPS technology or conventional survey methods to locate utilities.

### **1.04 SAFETY**

- A. Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavations" as described in OSHA publication 2226.

### **1.05 TESTING**

- A. Testing shall be performed by an approved independent laboratory.
- B. Compaction testing shall be performed in accordance with the requirements of ASTM D1556 or ASTM D6938.

## **PART 2 PRODUCTS**

### **2.01 TRENCH FOUNDATION MATERIALS**

- A. Crushed Stone: Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

**2.02 BEDDING AND HAUNCHING MATERIALS**

**A. Water Mains**

1. Unless specified otherwise, bedding and haunching materials shall be suitable materials that have been excavated from the trench and have been approved by the Engineer for use as pipe bedding and haunching. Materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials.
2. Crushed stone, if utilized for bedding and haunching, shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.
3. The Contractor’s attention is directed to Section 02616, paragraph 3.04.

**B. Sewers and Storm Drains:** Crushed stone utilized for bedding and haunching shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

**C. Filter Fabric - Non-Woven Type**

1. Filter fabric associated with bedding shall be a UV stabilized, spunbonded, continuous filament, needle-punched, polypropylene, non-woven geotextile.
2. The fabric shall have an equivalent open size (EOS or AOS) of 120 - 70. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
Weight	oz/yd <sup>2</sup>	ASTM D 3776	8.3	
Thickness	mils	ASTM D 1777	105	
Grab Strength	lbs.	ASTM D 4632	240	210
Grab Elongation	%	ASTM D 4632	>50	50
Tear Strength	lbs.	ASTM D 4533	100	85
Mullen Burst	psi	ASTM D 3786	350	320
Puncture Resistance	lbs.	ASTM D 4833	115	100
Permittivity	sec <sup>-1</sup>	ASTM D 4491	1.7	
Water Permeability	cm/sec	ASTM D 4491	0.4	
Water Flow Rate	gpm/ft <sup>2</sup>	ASTM D 4491	120	
UV Resistance (500 hrs)	%	ASTM D 4355	>85	
pH			2 - 13	

3. If ordered by the Engineer, the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of 10 days during initial pipe installation.
4. Filter fabric shall be equal to Polyfelt TS 700, Trevira 1125 or SuPac 7-MP.

### **2.03 INITIAL BACKFILL**

- A. Initial backfill material shall be crushed stone or earth materials as specified for bedding and haunching materials.
- B. Earth materials utilized for initial backfill shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, initial backfill materials shall be moistened to facilitate compaction by tamping.
- C. If materials excavated from the trench are not suitable for use as initial backfill material, provide select material conforming to the requirements of this Section.

### **2.04 FINAL BACKFILL**

- A. Final backfill material shall be general excavated earth materials, shall not contain rock larger than 2-inches at its greatest diameter, cinders, stumps, limbs, man-made wastes and other unsuitable materials.
- B. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

### **2.05 SELECT BACKFILL**

- A. Select backfill shall be materials that meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

### **2.06 CONCRETE**

- A. Concrete for bedding, haunching, initial backfill, or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 60.

### **2.07 FLOWABLE FILL**

- A. Controlled strength flowable fill shall be used as trench backfill only when authorized, in writing, by the Engineer.
- B. Controlled low strength flowable fill shall conform to Section 600 of the Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges – latest edition.

- C. Flowable fill design mix shall be for “excavatable” fill. Design mix shall be submitted to the Engineer for approval in accordance with Section 600.3.03 of the GDOT Standard Specifications.

## **2.08 GRANULAR MATERIAL**

- A. Granular material, where required for trench backfill, shall be sand, river sand, crushed stone or aggregate, pond screenings, crusher run, recycled concrete, or other angular material. Granular material shall meet gradation requirements for Size No. 57 or finer.

## **2.09 GRADED AGGREGATE BASE**

- A. Graded aggregate base shall be Class “A” meeting the requirements of the Georgia Department of Transportation Specification Section 815.01.

## **PART 3 EXECUTION**

### **3.01 TRENCH EXCAVATION**

- A. Topsoil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over finished graded areas.
- B. Trenches shall be excavated to the lines and grades shown on the Drawings with the centerlines of the trenches on the centerlines of the pipes and to the dimensions which provide the proper support and protection of the pipe and other structures and accessories.
- C. Trench Width:
  - 1. The sides of all trenches shall be vertical to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.
  - 2. Excavate the top portion of the trench to any width within the construction easement or right-of-way which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.
  - 3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 12-inches clearance between the rock and any part of the pipe, manhole, vault or other structure.
- D. Trench Depth:
  - 1. The trenches shall be excavated to the required depth or elevation which allow for the placement of the pipe and bedding to the dimensions and elevations shown on the Drawings.
  - 2. Where rock is encountered in trenches for pipelines, excavate to the minimum depth which will provide a clearance below the pipe barrel of 8-inches for pipe 21-inches in diameter and smaller and 12-inches clearance for larger pipe, manholes and other structures. Remove boulders and stones to provide above minimum clearances between the rock and any part of the pipe, manhole, vault or other structure.

E. Excavated Materials:

1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.
2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems.
3. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements and also allow access to valves and hydrants.

**3.02 SHEETING, SHORING AND BRACING**

- A. Sheeting, shoring and bracing is specified in Section 02150.
- B. Protection of the excavation against caving or settling of the banks shall be the sole responsibility of the Contractor. The Contractor shall protect the sides of his excavation by sheeting and bracing as may be necessary. No actions or instructions by the Engineer shall be regarded as the responsibility for security of the trench or the surrounding areas. The full responsibility remains with the Contractor.
- C. The Contractor shall furnish, put in place and maintain sheeting and bracing required to support the side of the excavation and prevent loss of ground which could damage or delay the work or endanger adjacent structures or vehicular traffic. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
- D. The Contractor shall leave in place to be imbedded in the backfill of the trench, all wood sheeting, bracing and other related items as shown on the Drawings, or which the Engineer may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Engineer may direct that timber used for sheeting and bracing in the trench be cut off at any specified elevation, after backfilling and tamping has reached this level.
- E. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction of other structures, utilities or property, whether public or private.
- F. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheeting and bracing to prevent any caving or moving of the ground adjacent to the sides of the trench.

- G. The Contractor shall receive no payment, other than that included in the price to be paid for pipe, for any extra timber used for sheeting, bracing and other related items. The Contractor shall receive no payment for such timber which was used for the convenience of the Contractor.

### **3.03 TEST PITS**

- A. Test pits for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work may be excavated by the Contractor. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as hereinafter specified.
- B. Excavation and backfill of test pits shall be considered work incidental to the project and the cost shall be included in the appropriate bid item.
- C. If, for any reason, a test pit is left open for any period of time, it shall be properly barricaded and lighted by the Contractor.

### **3.04 ROCK EXCAVATION**

- A. Definition of Rock: Any material which, in the opinion of the Engineer, cannot be excavated with conventional excavating equipment, and must be removed by drilling and blasting.
- B. Blasting:
  - 1. Exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the Engineer may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.
  - 2. Refer to Section 02020, Use of Explosives
- C. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.
- D. The Contractor shall notify the Engineer prior to any blasting. Additionally, the Contractor shall notify the Owner, all cities and/or counties having jurisdiction, and the local fire department before any charge is set.
- E. Following review by the Engineer regarding the proximity of permanent buildings and structures to the blasting site, the Engineer may direct the Contractor to employ an independent, qualified specialty sub-contractor, approved by the Engineer, to: monitor the blasting by use of a seismograph; identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos; and maintain a detailed written log.

### **3.05 DEWATERING EXCAVATIONS**

- A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.

- B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.
- C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the utility crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the Work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.
- D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.
- E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.
- F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the trench bottom. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

### **3.06 TRENCH FOUNDATION AND STABILIZATION**

- A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.
- B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the Engineer may determine that the trench bottom is unsuitable and the Engineer may then order trench stabilization by directing the Contractor to over excavate trench bottom and fill with crushed stone.
- C. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.
- D. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 95 percent of the maximum dry density, unless shown or specified otherwise.

### **3.07 BEDDING AND HAUNCHING**

- A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders, or large dirt clods.

- B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.
- C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.
- D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders, or dirt clods.
- E. Pipe Bedding:
  - 1. The Contractor shall furnish and install pipe on the type and thickness of bedding as shown on the Drawings or as specified by the Engineer.
  - 2. Pipe bedding requirements for large water transmission mains shall be as specified in Section 02667.
- F. Manholes, Vaults and Other Structures: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole, vault or structure. Place and compact crushed stone bedding material to the required grade before constructing the manhole, vault or structure.
- G. Compaction:
  - 1. Bedding and haunching materials under pipe, manholes, vaults, structures and accessories shall be compacted to a minimum of 95 percent of the maximum dry density, unless shown or specified otherwise.
  - 2. Bedding and haunching materials within the limits of restrained joint pipe shall be compacted to a minimum of 95 percent of the maximum dry density, unless shown or specified otherwise.

### **3.08 INITIAL BACKFILL**

- A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.
- B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least 12-inches above the pipe barrel. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.
- C. Backfill on both sides of the pipe simultaneously to prevent side pressures.

- D. Compact each layer thoroughly with suitable hand tools or tamping equipment.
- E. Initial backfill shall be compacted to a minimum 95 percent of the maximum dry density, unless shown or specified otherwise. Initial backfill within the limits of restrained joint pipe shall be compacted to a minimum 95 percent of the maximum dry density, unless shown or specified otherwise.
- F. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section for initial backfill.

### **3.09 CONCRETE ENCASEMENT FOR PIPELINES**

- A. Where concrete encasement is shown on the Drawings for pipelines, excavate the trench to provide a minimum of 12-inches clearance from the barrel of the pipe. Lay the pipe to line and grade on solid concrete blocks or solid bricks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 12-inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

### **3.10 FINAL BACKFILL**

- A. Backfill carefully to restore the ground surface to its original condition.
- B. The top 6-inches of backfill shall be topsoil or graded aggregate base material, depending upon the trench location.
- C. Excavated material which is unsuitable for backfilling, and excess material, shall be disposed of in a manner approved by the Engineer. Surplus soil may be neatly distributed and spread over the site, if approved by the Engineer, except that surplus soil shall not be distributed and spread over the site in areas under Corps of Engineers jurisdiction. If such spreading is allowed, the site shall be left in a clean condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.
- D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.
- E. Pipelines: After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:
  - 1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack"
  - 2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet
- F. Manholes, Vaults and other Structures:
  - 1. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. A variation of 2-feet in elevation will be the maximum allowable. Backfill shall not be allowed against walls until they and their supporting slabs, if applicable, have attained sufficient strength. Backfill shall be subject to the approval of the Engineer.

2. In locations where pipes pass through walls, the Contractor shall take the following precautions to consolidate the backfill up to an elevation of at least 2-feet above the bottom of the pipe:
    - a. Place fill in such areas for a distance of not less than 3-feet either side of the centerline of the pipe in level layers not exceeding 6-inches in depth.
    - b. Thoroughly compact each layer with a power tamper to the satisfaction of the Engineer.
  3. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.
- G. Final backfill shall be compacted to a minimum 95 percent of the maximum dry density, unless specified otherwise. Final backfill underlying pavement and backfill under dirt and gravel roads and within the limits of restrained joint pipe shall be compacted to a minimum 95 percent of the maximum dry density, unless specified otherwise.
- H. Concrete or bituminous asphalt removed during construction shall not be placed in backfill.
- I. The surface of filled areas shall be graded to smooth true lines in conformance with the grades or elevations shown on the Drawings.

### **3.11 ADDITIONAL MATERIAL**

- A. Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be as shown on the Drawings. Utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide additional suitable fill material.

### **3.12 BACKFILL WITHIN RIGHT-OF-WAYS**

- A. Compact backfill within the limits of the any right-of-way including the backfill underlying pavement and sidewalks, and backfill under dirt and gravel roads to a minimum 95 percent of the maximum dry density.

### **3.13 BACKFILL WITHIN GEORGIA DOT RIGHT-OF-WAY**

- A. Backfill within the Georgia DOT right-of-way shall meet the requirements stipulated in the "Utility Accommodation Policy and Standards", published by the Georgia Department of Transportation.

### **3.14 FLOWABLE FILL**

- A. Where flowable fill is utilized, excavate the trench to provide a minimum of 6-inches clearance on either side of the pipe barrel. Lay the pipe to line and grade on solid concrete blocks or bricks. In lieu of bedding, haunching and initial backfill, place flowable fill to the full width and depth of the trench.
- B. Flowable fill shall be protected from freezing for a period of 36 hours after placement. Minimum temperature of flowable fill at point of delivery shall be 50 degrees F.

### 3.15 COMPACTED GRANULAR MATERIAL

- A. Where compacted granular material is required as initial and final backfill material, it shall be placed after bedding and haunching material specified elsewhere has been placed. Compacted granular material shall be compacted to a minimum 95 percent of the maximum dry density.

### 3.16 TESTING AND INSPECTION

- A. The soils testing laboratory is responsible for compaction tests in accordance with paragraph 1.02 of this Section.
- B. Compaction tests:
  - 1. Compaction tests will be required in existing or proposed streets, sidewalks, driveways and other existing or proposed paved areas at varying depths and at intervals as determined by the Engineer.
  - 2. Minimum requirements for compaction testing shall be a minimum of one (1) test for each 400 feet or less of pipeline and one (1) test at each manhole, vault and other structure unless soil conditions or construction practices, in the opinion of the Engineer, warrant the need for additional tests. One (1) complete compaction test shall consist of individual tests in the same vertical plane over the installed pipe, beginning at a depth of 2-feet above the top of the pipe and at successive two feet vertical increments up to the top of the backfill.
  - 3. The Engineer shall direct where additional compaction tests will be performed along the Project route.
- C. The soils testing laboratory shall be responsible for inspecting and testing stripped site, sub grades and proposed fill materials.
- D. The Contractor's duties relative to testing include:
  - 1. Notifying laboratory of conditions requiring testing.
  - 2. Coordinating with laboratory for field testing.
  - 3. Providing excavation as necessary for laboratory personnel to conduct tests.
  - 4. Paying costs for additional testing performed beyond the required scope.
  - 5. Paying costs for re-testing where initial tests reveal non-conformance with specified requirements.
- E. Inspection
  - 1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill shall be subject to inspection by the Engineer.
  - 2. Foundations and shallow spread footing foundations shall be inspected by a geotechnical engineer, who shall verify suitable bearing conditions.

- F. Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state and federal authorities having jurisdiction.

**+++ END OF SECTION 02225 +++**

**SECTION 02616  
POLYETHYLENE ENCASUREMENT OF DUCTILE IRON PIPE**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. The Contractor shall furnish all labor, materials, equipment and incidentals to furnish and install polyethylene encasement of ductile iron water mains.
- B. The polyethylene encasement shall prevent contact with the pipe and the surrounding backfill and bedding material, but it is not intended to be completely airtight or watertight.

**1.02 SUBMITTALS**

- A. Complete shop drawings, samples and engineering data shall be submitted to the Engineer in accordance with the requirements of the General Conditions of the Contract Documents. In addition the following specific information shall be provided:
  - 1. Certificate of compliance with ANSI/AWWA C105/A21.5

**1.03 QUALITY ASSURANCE**

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or specified herein.
  - 1. ANSI/AWWA C105/A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems
  - 2. ANSI/AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - 3. ASTM D149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
  - 4. ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
  - 5. ASTM D1709 – Standard Test Methods for Impact Resistance of Thin Plastic Film by the Free-Falling Dart Method.
  - 6. ASTM D1992 – Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.
  - 7. ASTM D4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

**PART 2 PRODUCTS**

**2.01 POLYETHYLENE FILM**

- A. Polyethylene film shall be shall be manufactured in accordance with AWWA/ANSI C105/A21.5.

B. Linear low-density polyethylene film.

1. Linear low-density polyethylene film shall be manufactured of virgin polyethylene material in accordance with ASTM D4976.
2. Physical properties of finished film:

Tensile Strength	3,600 psi*
Elongations	800 percent*
Dielectric Strength	800 V/mil thickness minimum
Impact Resistance	600 g minimum
Propagation Tear Resistance	2,550 grams force minimum*

\* Minimum in machine and transverse direction

3. Linear low-density polyethylene film shall have a minimum thickness of 0.008-inches (8 mil).

C. High-density cross laminated polyethylene film.

1. High-density cross laminated polyethylene film shall be manufactured of virgin polyethylene material in accordance with ASTM D4976.
2. Physical properties of finished film:

Tensile Strength	6,300 psi*
Elongations	100 percent*
Dielectric Strength	800 V/mil thickness minimum
Impact Resistance	800 g minimum
Propagation Tear Resistance	250 grams force minimum*

\* Minimum in machine and transverse direction

3. High-density cross laminated polyethylene film shall have a minimum thickness of 0.004-inches (4 mil).

D. Polyethylene film to be supplied shall be black (weather resistant) in color.

E. Tube or sheet width sizes shall be as shown on the following table:

Pipe Diameter (inches)	Polyethylene Width Flat Tube (inches)	Polyethylene Width Sheet (inches)
3	14	28
4	14	28
6	16	32
8	20	40
10	24	48
12	27	54
14	30	60
16	34	68
18	37	74
20	41	82
24	54	108
30	67	134
36	81	162
42	81	162
48	95	190
54	108	216
60	108	216
64	121	242

- F. The polyethylene film supplied shall be clearly marked every two feet along its length with the following information in one-inch high (minimum) letters:

Manufacturer's name or trademark  
Year of manufacture  
ANSI/AWWA C105/A21.5  
Minimum film thickness and material type  
Applicable range of nominal pipe diameter size(s)  
Warning – Corrosion Protection – Repair any damage

- G. Polyethylene adhesive tape 1-1/2-inches wide shall be used to seal joints.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. The Contractor shall remove all lumps of clay, mud, cinders, etc. on the pipe surface before installation of the polyethylene encasement. During installation, soil or embedment material shall not be trapped between the pipe and the polyethylene.

- B. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings and to prevent damage to the polyethylene caused by backfilling operations. Overlaps shall be secured with adhesive tape.
- C. For installation below the water table tube form polyethylene shall be used with both ends sealed with tape or plastic tie straps at the joint overlap. Circumferential wraps of tape shall be placed at 2- foot intervals along the barrel of the pipe to minimize the space between the polyethylene and the pipe.
- D. Installation on ductile iron pipes shall be in accordance with methods A, B or C as outlined in ANSI/AWWA C105/A21.5 and as specified below. Methods A and B are for use with polyethylene tubes and Method C is for use with polyethylene sheets.

1. Method A:

- a. Cut polyethylene tube to a length approximately 2-feet longer than the pipe section. Slip the tube around the pipe, centering it to provide 1-foot overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears the pipe ends.
- b. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at the joints to facilitate installation of the polyethylene tube.
- c. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack along the barrel of the pipe, securing the fold at quarter points. Proceed to the next section of pipe in the same manner.

2. Method B:

- a. Cut polyethylene tube to a length approximately 1-foot shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide 6-inch of bare pipe at each end. Take up the slack width at the top to the pipe for a snug but not tight fit along the barrel of the pipe securing the fold at quarter points. Secure the ends with polyethylene tape.
- b. Before making up a joint, slip a 3-foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. Alternatively, place a 3-foot length of polyethylene sheet in the trench under the joint to be made. After completing the joint, pull the 3-foot length of polyethylene over or around the joint. Overlapping the polyethylene previously installed on each end snug and secure with polyethylene tape. A shallow bell hole is necessary and shall be made at joints to facilitate the installation of the polyethylene tube or sheet.

3. Method C:

- a. Cut polyethylene sheet to a length approximately 2-feet longer than that of the pipe section. Center the cut length to provide a 12-inch overlap on each adjacent pipe section,

bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe so that it circumferentially overlaps the top quadrant of the pipe. Secure the cut edge of the polyethylene sheet at intervals of approximately 3-feet.

- b. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at the joints to facilitate installation of the polyethylene. After completing the joint, make the overlap and secure the ends as specified in Paragraph 3.01B of this Section.

E. Care shall be taken when installing backfill to prevent damage to the wrapping.

### **3.02 REPAIRS**

- A. Repair cuts, tears, punctures, or damage to polyethylene with adhesive tape or with a short length of polyethylene sheet, or with a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

### **3.03 OPENINGS IN ENCASEMENT**

- A. Provide openings for blow-offs, air and vacuum valves, and similar appurtenances by cutting an X in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely to the appurtenance, and repair the cut and any other damaged areas in the polyethylene with tape.
- B. Direct service taps may also be made through the polyethylene with any resulting damaged areas being repaired as described above. To make direct service taps, apply multiple wraps of adhesive tape completely around the polyethylene-encased pipe to cover the area where the tapping machine and chain will be mounted. After the tapping machine is mounted, the corporation stop shall be installed directly through the tape and polyethylene. After the direct tap is completed, the entire circumferential area shall be inspected for damage and repaired if needed.

### **3.04 JUNCTIONS BETWEEN WRAPPED AND UNWRAPPED PIPE**

- A. Where polyethylene wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least 3-feet. Secure the end with circumferential turns of adhesive tape.
- B. Service lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a clear minimum distance of 3-feet away from the ductile iron pipe.

### **3.05 BACKFILL FOR POLYETHYLENE-WRAPPED PIPE**

- A. Use the same backfill as that specified for pipe without polyethylene wrap, exercising care to prevent damage to the polyethylene wrapping when placing backfill.

+++ END OF SECTION 02616 +++

**SECTION 02645  
FIRE HYDRANTS**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. The Contractor shall furnish all labor, materials and equipment to install and test fire hydrants as specified herein and as shown on the Drawings.
- B. Fire hydrants shall be Mueller Super Centurion 250 A-423, modified to meet the water utility's standard requirements as specified in this section. In order to insure compatibility with the water utility's existing inventory of hydrants and spare parts and standardized maintenance procedures, no other hydrants shall be acceptable.

**1.02 QUALITY ASSURANCE**

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards, unless indicated otherwise on the Drawings or specified herein.
  - 1. ANSI B18-2.1 - Standard specification for Square and Hex Bolt Screws, including Askew Head Bolts, Hex Cap Screws and Lag Screws
  - 2. ANSI/AWWA C110/A21.10 - Ductile Iron and Gray Iron Fittings
  - 3. ANSI/AWWA C111/A21.11 - Rubber Gaskets Joints for Ductile Iron Pressure Pipe and Fittings.
  - 4. ANSI/AWWA C151/A21.51 - Ductile Iron Pipe, Centrifugally Cast
  - 5. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.
  - 6. ANSI/AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants
  - 7. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.
  - 8. AWWA M17 - Installation, Field Testing and Maintenance of Fire Hydrants.
- B. Testing and Inspection: The Contractor shall perform all tests and inspections required by this specification unless otherwise stated. The Contractor may use the manufacturer's facility or any independent laboratory acceptable to the Owner. The Owner reserves the right to perform any of the test and inspection requirements where such tests and inspections are needed to further determine compliance with this specification.
- C. Samples, visual tests and inspections may be required by the Owner. These shall be performed and witnessed in the presence of the Engineer at no extra cost. Failure to comply with this provision may cause rejection of the hydrants.

### 1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition the following specific information shall be provided:
  - 1. Shop Drawings and Product Data
  - 2. Certificate of compliance with the requirements of ANSI/AWWA C502.
  - 3. Records of standard tests.

## PART 2 PRODUCTS

### 2.01 FIRE HYDRANTS

- A. Fire hydrant shall be three way, post type, dry top traffic design model with compression main valve opening against and closing in the direction of normal water flow. Hydrant shall be designed for 250 psi working pressure.
- B. Fire hydrants shall conform to the requirements of ANSI/AWWA C502.
- C. Manufacture
  - 1. Hydrant shall have the name of the manufacturer, the year of manufacture, operating pressure and valve size in legible raised letters cast on the barrel. Hydrant shall also have the letters "AWB" cast on the barrel for identification purposes.
  - 2. Dry Top Bonnet:
    - a. Bonnet shall be constructed with a moist proof lubrication chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated.
    - b. Bonnet assembly shall be comprised of a top O-ring serving as a dirt and moisture barrier and a lower O-ring which will serve as a pressure seal. The O-ring packing shall be included in an oil filled reservoir so that all operating parts are enclosed in a sealed oil bath.
    - c. O-rings shall be Buna N in accordance with ASTM D2000.
    - d. An oil filler plug shall be provided in the bonnet to permit checking of the oil level and adding oil when required.
  - 3. Operating Nut
    - a. Operating nut shall be ASTM B584 bronze, 7/8 - 1 inch tapered square nut with tamper-proof device.
    - b. The tamper proof device shall be a ductile iron combination hold-down nut and operating nut shield to eliminate operation of hydrant with wrenches other than a special socket-type wrench. Arrow shall be cast on the periphery of the bonnet indicating direction of the operation for opening the

hydrant.

4. Nozzles

- a. Fire hydrant shall have two (2) 2-1/2 inch hose connections, 120 degrees apart and one (1) 4-1/2 inch pumper connection, with National Standard threads. Nozzles to be made of bronze and have interlocking lugs to prevent blowout.
- b. Nozzle caps nuts shall have the same cross section as the operating nut on the bonnet. Nozzle caps shall be secured to the fire hydrant with non-kinking type steel chain with chain loop on cap ends to permit free turning of caps.
- c. Outlet Nozzle Threads shall conform to the National Fire Protection Association (NFPA) for National Standard Fire Hose Coupling Screw Threads.

5. Main Valve

- a. The internal main valve diameter shall be a minimum of 5 1/4- inches.
- b. The valve shall be designed to open against pressure and close with pressure.
- c. Valve shall be made of synthetic rubber and formed to fit the valve seat accurately.
- d. The valve shall be reversible.

6. Main Valve Seat

- a. The main valve seat shall be ASTM B584 bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement.
- b. Two (2) O ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe.
- c. Valve assembly pressure seals shall be obtained without the employment of torque or torque compressed gaskets.
- d. The hydrant shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single disassembly wrench without excavating.

7. Traffic Design

- a. Hydrant barrel section shall be connected at the ground line in a manner that will prevent damage to the hydrant when struck by a vehicle.
- b. Main valve rod section shall be connected at the ground line by a frangible coupling.
- c. The barrel and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant barrel.

8. Drain

- a. The drain mechanism shall be designed to operate with the operation of

- the main valve and shall allow a momentary flushing of the drain ports.
  - b. A minimum of two (2) internal positive opening drain valves and two (2) external bronze lined drain ports shall be required in the main valve assembly to drain the hydrant barrel.
  - c. The drain valve facings shall be made of either rubber or polyethylene material and retained in position with stainless steel screws.
- 9. Shoe
  - a. Shoe shall be ductile iron, ASTM A536, grade 65-45-12. Interior of shoe shall be epoxy coated in accordance with ANSI/AWWA C550.
  - b. Main valve travel stop shall be an integral part of the shoe permitting full opening of the hydrant and positive stop without over travel of the stem.
- 10. Barrel Extension Sections: Barrel extension sections shall be available in six (6) inch increments complete with rod, extension, coupling and necessary flanges gaskets and bolts so that extending the hydrant can be accomplished without excavating.
- 11. Nuts and Bolts: Nuts and bolts shall be corrosion resistant. Bolt material shall develop the physical strength requirements of ASTM A307 and may have either regular or square heads with dimensions conforming to ANSI B18.2.1 Nuts, bolts and studs shall be cadmium-plated (ASTM A165, grade NS) or zinc-coated (ASTM A153 or ASTM B633), or rust-proofed by a process acceptable to the Engineer.
- 12. O Rings: O rings shall be rubber and conform to the requirements of ASTM 2000.
- 13. Markings: Bury mark of fire hydrant shall be cast on the barrel of the hydrant. The bury mark shall provide not less than 18-inches of clearance from the centerline of the lowest nozzle to the ground.
- 14. Direction of Opening: Hydrant shall be designed to open "right" or clockwise.
- 15. Joint Assemblies: Complete joint assemblies consisting of glands, gaskets, bolts and nuts shall be furnished.
- 16. Coating and Painting
  - a. All iron parts of the hydrant, inside and outside, shall be cleaned and all surfaces shall be coated with a two part epoxy. Epoxy shall be Amercoat 370.
  - b. The outside of the hydrant above ground level shall be cleaned and thereafter shop painted with two (2) coats of Sherwin Williams Quick Dry Alkyd Enamel, Mueller paint code RP. Color shall be aluminum.
- 17. Lubrication: All bronze, threaded contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rustproof compound to prevent damage in shipment and storage.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected or held for inspection by the Engineer.

### **3.02 HYDRANT INSTALLATION**

- A. Hydrants shall be placed at the locations indicated on the Drawings. The Contractor shall install proper "bury" hydrants or shall use, at no cost to the Owner, proper length extensions to ensure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of these Specifications.
- B. Hydrants shall stand plumb with pumper nozzle facing the roadway.
- C. Hydrants shall be set to the finished grade with the centerline of the lowest nozzle 18-inches above finished grade.
- D. When placed behind curb, the hydrant barrel shall be set such that the distance from the face of the curb to the edge of the hydrant shall be 21-inches. Where no curb exists, the hydrant shall be set as directed by the Engineer.

### **3.03 CONNECTION TO WATER MAIN**

- A. Fire hydrant shall be connected to the water main with a ductile iron branch connection. Gate valves shall be used on fire hydrant branches as shown on the Drawings.
- B. The connection of the hydrant to the water main shall be through a ductile iron hydrant tee or a welded outlet for main lines with a diameter of 24-inches or greater. Tapping sleeves shall not be allowed.
- C. Hydrants shall be attached to the water main by the following method:
  - 1. For water mains 20 inches and smaller, the isolation valve shall be attached to the water main by connecting the valve to the hydrant tee.
  - 2. For water mains 24 inches and larger, the isolation valve shall be attached to the water main by providing an anchor coupling between the valve and welded outlet or hydrant tee.
  - 3. The isolation valve shall be attached to the hydrant by providing an anchor coupling between the valve and hydrant, if the hydrant and valve are less than two feet apart. Otherwise, provide mechanical joint ductile iron pipe with retainer glands on the hydrant and valve.

- D. Pipe connecting the fire hydrant to the water main shall be 6-inch diameter class 350 ductile iron pipe meeting the requirements of Section 02665, Water Mains and Accessories. Anchor coupling shall be as specified in Section 02665.
- E. Anchoring and Bracing: The shoe of each fire hydrant and the hydrant tee shall be braced against unexcavated earth at the ends of the trench with poured concrete thrust blocks as shown on the Drawings.
- F. Drainage: No. 57 stone shall be placed around the shoe of the fire hydrant for a minimum distance of 18-inches below the drain ports, 6-inches above the drain ports, 15-inches laterally on each side of the shoe and 24-inches from the back of the shoe towards the main.
- G. Provide resistance to avoid transmitting shock moment to the lower barrel and inlet connection by pouring a concrete collar 6-inches thick with a diameter of 24 inches at the ground line around the hydrant barrel.

**3.04 FIELD PAINTING**

- A. After hydrant is installed and approved by the Engineer, the Contractor shall touch up all exposed hydrant surfaces as directed by the Engineer. Touch up paint shall be as specified in paragraph. 2.01 C 16 of this Section.
- B. The bonnet of each hydrant shall be painted in one of the following colors to indicate the diameter of the water main that the hydrant is connected to:

Water Main Diameter (inches)	Hydrant Bonnet Color
6 - 8	Silver
10 - 12	Yellow
16 and larger	Green

- C. Hydrants that are connected to non-potable water mains (i.e. raw water mains) shall be painted violet (light purple).
- D. Private hydrants shall be painted red.

**3.05 TESTING**

All fire hydrants shall be tested in strict accordance with the requirements of ANSI/AWWA C502, with no additional cost to the Owner. A certificate of compliance will be furnished to the Engineer.

**3.06 REMOVAL AND SALVAGE OF EXISTING HYDRANTS**

- A. Remove all existing hydrants shown on the Drawings to be removed. Hydrants shall be removed as follows:
  1. Disconnect hydrant from barrel section.
  2. Saw cut or remove barrel section to a minimum of 12-inches below finished grade.
  3. Remove hydrant valve cover and concrete pad, valve box and extension stem.

Insure that valve is closed. Valve shall remain in place.

4. Deliver removed hydrant, valve cover, valve box and extension stem to the water utility's storage yard as directed by the Engineer.
- B. Backfill excavations and compact as specified in Section 02225 and restore area as required and as directed by the Engineer.

**+++ END OF SECTION 02645 +++**

**SECTION 02665  
WATER MAINS AND ACCESSORIES**

**PART I GENERAL**

**1.01 SCOPE**

- A. Furnish all labor, materials, equipment and incidentals required for the complete installation of water mains and accessories as shown on the Drawings and as specified herein. The Work of this Section also includes, but is not limited to, hydraulic testing and disinfection of the completed water mains after installation.
- B. This Section includes ductile iron pipe and fittings ranging in size from 4-inches in diameter through 64-inches in diameter.
- C. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.
- D. Galvanized pipe and fittings shall not be used as any part of the Water Transmission and Distribution System, nor shall it be used to join any appurtenances to the System.

**1.02 QUALITY ASSURANCE**

- A. Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or otherwise specified.
  - 1. ANSI/AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
  - 2. ANSI/AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings
  - 3. ANSI/AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - 4. ANSI/AWWA C115/A21.15 – Flanged Ductile-Iron Pipe with Ductile- Iron or Gray-Iron Threaded Flanges
  - 5. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe
  - 6. ANSI/AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast
  - 7. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings for Water Service
  - 8. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
  - 9. ANSI /AWS D11.2 – Guide for Welding Iron Castings
  - 10. AWWA C651 – Disinfecting Water Mains

### **1.03 SUBMITTALS**

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:
  - 1. Product data and engineering data, including shop drawings.
  - 2. Evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two (2) years.
  - 3. Written certification that all products furnished comply with all applicable requirements of these specifications.
- B. For pipe 24-inches in diameter or greater, submit shop drawings to the Engineer for review showing a complete laying plan of all pipe, including all fittings, adapters, valves and specials along with the manufacturer's drawings and specifications indicating complete details of all items. The pipe details shall include stationing, pipe class or design and supporting computations; and laying schedule which specifies pipe class, class coding, pipe stationing for all changes in grade or horizontal alignment, transition stations for various pipe classes and the limits of each reach of restrained joint pipe. The above shall be submitted to the Engineer for review before fabrication and shipment of these items.

### **1.04 TRANSPORTATION AND HANDLING**

- A. Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.
- B. Handle pipe, fittings, and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

### **1.05 STORAGE AND PROTECTION**

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.
- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.
- D. Stored mechanical and push-on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

- E. Mechanical joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

**1.06 WATER MAIN LOCATION**

- A. The minimum depth of cover over the pipe shall be four (4) feet and the maximum cover shall be five (5) feet. Any deviations must be approved by the Engineer.
- B. The installation of the water main parallel to another utility in the same vertical plane is not permitted, i.e., “stacking of utilities is not permitted.

**PART 2 PRODUCTS**

**2.01 DUCTILE IRON PIPE**

- A. Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 18	350
20	300
24	250
30 - 64	200

- B. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer.
- C. Fittings shall be ductile iron and shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 with a minimum rated working pressure of 250 psi.
- D. Joints
  - 1. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Push-on and mechanical joints shall conform to ANSI/AWWA C111/A21.11.
  - 2. The only acceptable restrained joint systems are identified in the table below. No field welding of restrained joint pipe will be allowed.

Acceptable Restrained Joints				
Pipe Dia. (inches)	ACIPCO	U.S. Pipe	McWane	Generic*
4 – 12	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 – 24	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 – 36	Flex Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 – 48	Flex-Ring	TR Flex	N/A	MJ with Retainer Gland
54 – 64	Lok-Ring	TR Flex	N/A	N/A

\* Fittings and valves only, and only where specifically allowed.

3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet.
  4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
- E. Gaskets: Gaskets for the various types of joints shall be as follows:
1. Gaskets for mechanical joints shall be made of vulcanized styrene butadiene (SBR) as specified in ANSI/AWWA C111/A21.11 unless specified otherwise. Reclaimed or natural rubber shall not be used. Gaskets shall be free from porous areas, foreign material and other defects that make them unfit for the use intended.
  2. Gaskets for flanged joints shall be made of synthetic rubber, ring type or full face type and shall be 1/8-inch thick. Gaskets shall conform to the dimensions specified in ANSI/AWWA C111/A21.11.
  3. Gaskets for push-on and restrained joints shall be in accordance with the pipe manufacturer's design dimensions and tolerances. Gaskets shall be made of vulcanized styrene butadiene (SBR) as specified in ANSI/AWWA C111/A21.11 unless specified otherwise.
- F. Bolts and Nuts
1. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit.
  2. Bolts and nuts for mechanical joints shall be tee head bolts and nuts of high-strength low-alloy steel having a minimum yield strength of 45,000 psi. Dimensions of bolts and nuts shall be in accordance with the dimensions shown in ANSI/AWWA C111/ A21.11.

3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
  4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A563. Zinc plating shall conform to ASTM B633, Type II.
  5. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A194, Grade 8.
- G. Mechanical joint glands shall be ductile iron.
- H. Welded Outlets: Welded outlets may be provided in lieu of tees or saddles on mains with a diameter greater than or equal to 24-inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 (Pressure Class 350 for 60 and 64-inch sizes). The welded outlet shall be rated for 250 psi working pressure. Each welded outlet shall be hydrostatically tested at 500 psi. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in the table below:

Parent Pipe Diameter, Inches	Maximum Outlet Diameter, Inches
24	16
30	20
36	24
42	30
48	30
54	30
60	30
64	30

- I. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end from either direction on that pipe size. The thrust collars shall be continuously welded to the pipe by the pipe manufacturer.
- J. Solid sleeves shall be used to connect plain end ductile iron pipe. Solid sleeves shall meet the requirements of ANSI/AWWA C110/A21.10 for long pattern and have a minimum pressure rating of 250 psi. Solid sleeves shall have mechanical or restrained joints as specified in this section or as shown on the Drawings. Solid sleeves shall be used only in locations shown on the Drawings or at the discretion of the Engineer. Solid sleeves shall be manufactured by American Cast Iron Pipe Company or U. S. Pipe.
- K. Pipe stubs for all structure connections shall not exceed 2-feet in length. Caps shall be furnished where required.
- M. Cement Lining

1. Interior surfaces of all ductile iron pipe and fittings shall be cleaned and lined with a cement mortar lining applied in conformity with ANSI/AWWA C104/A21.4. If lining is damaged or found faulty upon delivery, the damaged pipe sections shall be repaired or removed from the site as directed by the Engineer.
2. The minimum lining thickness shall be as shown in the following table. Lining shall be square and uniform with regard to the longitudinal axis of the pipe.

Pipe Diameter (Inches)	Minimum Lining Thickness (Inches)
3 - 12	1/8
14 - 24	3/32
30 - 64	1/8

- N. Pipe Coating: Unless otherwise specified, pipe and fittings shall be coated with a 1 mil asphaltic coating as specified in ANSI/AWWA C151/A21.51.
- O. Polyethylene Encasement: Ductile iron pipe shall be encased with polyethylene film where shown on the Drawings, specified or directed by the Engineer. Polyethylene film shall be as specified in Section 02616.
- P. Pipe Insulation: Where a water main is exposed to the elements because the pipe is above ground, the Engineer shall determine whether the pipe is to be insulated or not. Where insulation is to be furnished and installed it shall conform to the following:
1. Insulating material shall be 3-inch thick polyurethane pipe covering formed to fit the pipe diameter.
  2. Outer covering shall be 0.016-inch thick aluminum chiller jacket with moisture shield and secured with stainless steel wire or stainless steel straps.
- Q. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

## 2.02 PIPING APPURTENANCES

### A. Mechanical Joint Restraint

#### 1. Design

- a. Restraint devices for pipe sizes 3 inches through 48 inches in diameter shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.
- b. Restraint devices shall have a working pressure rating of 350 psi for 3-inch through 16-inch diameter pipe and 250 psi for 18-inch through 48-inch diameter pipe. Ratings shall be for water pressure and shall include a minimum safety factor of 2 to 1 for all pipe diameters.

#### 2. Material

- a. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
  - b. Ductile iron gripping wedges shall be contoured to fit on the pipe and shall be heat treated within a range of 370 to 470 BHN.
  - c. Dimensions of the glands shall be such that they can be used with the standard mechanical joint bell and tee head bolts conforming to the requirements of ANSI/AWWA C111/A21.11 and ANSI/AWWA C 153/A21.53, latest editions.
3. Approvals
- a. Restraint devices shall be listed by Underwriters Laboratories (3-inch through 24-inch size) and approved by Factory Mutual (3-inch through 12-inch size).
  - b. Mechanical joint restraint shall be Megalug Series 1100 as manufactured by EBAA Iron Inc., Uni-Flange Series 1400, as manufactured by Ford Meter Box Company or approved equal.

B. Hydrant Connections

- 1. Pipe: Pipe shall have mechanical joint ends and be as specified in paragraph 2.02 of this Section.
- 2. Hydrant Tees: Hydrant tees shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Tapping saddles shall not be allowed.
- 3. Anchor Couplings:
  - a. Anchor couplings for hydrant installation shall be class 350 ductile iron pipe meeting the requirements of AWWA C151/ANSI A21.51, Class 53 and shall have an anchoring feature at both ends so that when used with mechanical joint split glands a restrained joint is provided.
  - b. Anchor couplings shall be cement lined in accordance with ANSI/AWWA C104/ A21.4 and shall have a bituminous coating in accordance with ANSI/AWWA C151/A21.51.
  - c. Anchor couplings shall be equal to swivel anchor pipe and couplings as manufactured by Fab Pipe, Inc., Tyler Utilities Division of Union Foundry Company or approved equal.
- 4. Hydrant Connector Pipe:
  - a. Hydrant connector pipe shall be class 350 ductile iron meeting the requirements of ANSI/AWWA C153/A21.53 and shall be offset design so that the hydrant can be adjusted to ensure placement at the proper grade. Connector pipe shall have an anchoring feature at both ends so that when used with mechanical joint split glands a restrained joint is provided.
  - b. Hydrant connector pipe shall be cement lined in accordance with ANSI/AWWA C104/ A21.4 and have a bituminous coating in accordance with ANSI/AWWA C151/A21.51.

- c. Hydrant connector pipe shall be equal to the Gradelok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.
  - d. Hydrant connector pipe shall not be used unless specifically directed by the Engineer.
- C. Tapping Saddles: Tapping saddles are not allowed.
- D. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2-inches when buried less than 10-inches below the surface. Tape width shall be a minimum of 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

### **PART 3 EXECUTION**

#### **3.01 LAYING AND JOINTING PIPE AND ACCESSORIES**

- A. Lay all pipe and fittings to accurately conform to the lines and grades as shown on the Drawings or as established by the Engineer.
- B. Pipe Installation
  - 1. Proper equipment, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
  - 2. All pipe, fittings, valves, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.
  - 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.
  - 4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
  - 5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
  - 6. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
  - 7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.

8. Provide detection tape for all pipe greater than 12-inches in diameter. Detection tape shall be buried 4 to 10-inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finish grade surface.

C. Alignment and Gradient

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories at the work site to lay out angles and ensure that deflection allowances are not exceeded.

D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the Engineer.

E. Joint Assembly

1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. The Contractor shall inspect each pipe joint within 1,000 feet on either side of main line valves to insure 100 percent seating of the pipe spigot, except as noted otherwise.
3. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.
4. The Contractor shall internally inspect each pipe joint to insure proper assembly for pipe 24-inches in diameter and larger after the pipe has been brought to final alignment.

F. Cutting Pipe: The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut. Cement lining shall be undamaged.

G. Polyethylene Encasement: Installation shall be in accordance with ANSI/AWWA C105/A21.5 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the Engineer.

### **3.02 CONNECTIONS TO WATER MAINS**

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary for the Engineer to confirm the nature of the connection to be made.

- C. Interruption of Services: Make connections to existing water mains only when system operations permit and only when notices are issued to the customer. The Contractor will operate existing valves only with the specific authorization and direct supervision of the Owner.
- D. Tapping Sleeves
  - 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
  - 2. Prior to attaching sleeve, the pipe shall be thoroughly cleaned utilizing a brush and rag as required.
  - 3. Before performing field machine cut, the watertightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five minutes.
  - 4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one percent hypochlorite solution.
- E. Connections using Solid Sleeves: Where connections are shown on the Drawings using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the pipe line including cutting, excavation and backfill.
- F. Connections Using Couplings: Where connections are shown on the Drawings using couplings, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, excavation and backfill.

### 3.03 THRUST RESTRAINT

- A. Provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: Provide retainer glands where shown on the Drawings. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- C. Harnessing
  - 1. Provide harness rods only where specifically shown on the Drawings or directed by the Engineer.
  - 2. Harness rods shall be manufactured in accordance with ASTM A36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
  - 3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90 degree bend eye bolts.

4. Eye bolts shall be of the same diameter as specified in ANSI/AWWA C111/A21.11 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.

D. Thrust Collars: Collars shall be constructed as shown on the Drawings.

E. Concrete Blocking

1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings.
2. Concrete shall be as specified in Section 03301, Concrete and Reinforcing Steel.
3. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the Engineer. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

### 3.04 INSPECTION AND TESTING

- A. All sections of the water main shall be hydrostatically pressure tested in accordance with AWWA C600 and these Specifications. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
- B. Water used for flushing and testing mains and other construction purposes will be made available to the Contractor as specified in Section 01040.
- C. Each segment of newly installed water main between main valves shall be tested individually in the presence of the project engineer or inspector.
- D. Test Preparation
  1. For water mains less than 24-inches in diameter, flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For water mains 24-inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the Engineer. Partially open valves to allow the water to flush the valve seat.
  2. Partially operate valves and hydrants to clean out seats.
  3. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.
  4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation stops at high points to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed with a meter box as shown on the Drawings.
  5. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure.

6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
  7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
- E. Test Pressure: Test the pipeline at 250 psi measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gauge with graduation not greater than 5 psi.
- F. Testing Allowance
5. Testing allowance shall be defined as the sum of the maximum quantity of makeup water that must be added into the pipeline undergoing hydrostatic pressure testing, or any valved section, in order to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
  6. The Owner assumes no responsibility for leakage occurring through existing valves.
- G. Test Results: No installed pipe shall be accepted if the quantity of makeup water exceeds the limits determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{148,000}$$

Where: L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

As determined under Section 5 of ANSI/AWWA C600.

- H. If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.
- I. After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.
- J. At the conclusion of the work, the Contractor shall thoroughly clean all new pipelines by flushing with water or other means to remove all dirt, stone, pieces of wood or other material which may have entered the pipeline during the construction period.
- K. The Contractor shall be responsible for legal disposal of all water used for flushing and testing.

- L. A written copy of the test results with the observed allowable leakage confirmed by the project inspector shall be provided to the city through coordination and written correspondence with the County.

**+++ END OF SECTION 02665 +++**

**SECTION 02668**  
**WATER SERVICE CONNECTIONS**

**PART I GENERAL**

**1.01 SCOPE**

- A. Furnish all labor, materials, equipment and incidentals required for installing and testing water service connections complete as shown on the Drawings and as specified herein.
- B. The work of this Section is limited to water service connections 2-inches in diameter and smaller and may include all or some of the following:
  - 1. The installation of new water service connections from new and existing water mains.
  - 2. The transfer of existing service connections from existing water mains to new water mains.
  - 3. Installing meter boxes and lids for service lines up to 1-inch.
  - 4. Furnishing and installing meter boxes for 1½ -inch and 2-inch service lines.
- C. Water meters shall not be furnished or installed. However the water meter connections must be compatible with the water meters currently in use by the water utility.
- D. No galvanized pipe or fittings shall be used on water services.
- E. Definitions:
  - 1. Long side connection: A long side connection is a connection done with the meter on the opposite side of the street as the water main.
  - 2. Short side connection: A short side connection is a connection done with the meter on the same side of the street as the water main.

**1.02 SERVICE COMPATIBILITY**

- A. All water service connections shall duplicate those presently in use by the Owner in order to insure service compatibility with their service maintenance procedures.

**1.03 QUALITY ASSURANCE**

- A. Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or otherwise specified.
  - 1. ANSI/AWWA C800 – Underground Service Line Valves and Fittings
  - 2. ASTM B88 – Standard Specification for Seamless Copper Water Tube
  - 3. NSF/ANSI Standard 61 – Drinking Water System Components – Health Effects

#### 1.04 MATERIAL TO BE FURNISHED BY THE OWNER

- A. The Owner will furnish the following materials to the Contractor for installation under this Contract:
  - 1. Oval cast iron meter boxes with lids for installation with  $\frac{3}{4}$ -inch and 1-inch meters.
  - 2. Rectangular cast iron meter box lids and frames for installation with 1  $\frac{1}{2}$ - inch and 2-inch meters.
  - 3. The Owner will not supply meter boxes for 1  $\frac{1}{2}$ -inch and 2-inch meter installations.
- B. Refer to Standard Details as shown on the Drawings

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Meter Boxes for 1 1/2-inch and 2-inch service lines: Meter boxes for 1 1/2-inch and 2-inch service lines shall be constructed of concrete masonry units as specified in Section 04000, Masonry, concrete as specified in Section 03301, Concrete and Reinforcing Steel or precast concrete.
- B. Service Line
  - 1. Service line shall be copper tubing. Tubing shall be Type K, rolled type, conforming to ASTM B88.
  - 2. Fittings shall be cast copper alloy with compression type inlet and outlet connections.
  - 3. Where required, adapters shall be brass.
- C. Valves and Accessories
  - 1. Ball Valves
    - a. Ball valves shall be full port, heavy duty type and shall seal full rated pressure with flow in either direction.
    - b. Valve body shall be bronze conforming to ASTM B62, with threaded ends. End connections shall be compression type for type K copper tubing and shall be furnished with meter swivel nuts, with meter gasket, for 5/8-inch through 1-inch meter connections and flanged end for 1  $\frac{1}{2}$ -inch and 2-inch meter connections.
    - c. Valves shall have a maximum water pressure rating of 300 psi.
    - d. Valves shall have a maximum water temperature rating of 180 degrees F.
    - e. Valves shall be Mueller 300 ball valves or approved equal.
  - 2. Corporation Stops

- a. Corporation stops shall be ball type and shall be made of bronze conforming to ASTM B62.
  - b. Corporation stops shall be suitable for a maximum water pressure rating of 300 psi.
  - c. Inlet shall be tapered thread conforming to AWWA C800.
  - d. Outlet connection shall be threaded for compression type connection for type K copper tubing
  - e. Corporation stop shall be model B-25008 as manufactured by Mueller Company or model 3128B as manufactured by A.Y. McDonald Manufacturing Co. or approved equal.
3. Curb Stops
- a. Curb stops shall be ball type and shall be made of bronze conforming to ASTM B62.
  - b. Curb stops shall be suitable for a maximum water pressure rating of 300 psi.
  - c. Inlet connection shall be threaded for compression type connection for type K copper tubing. Outlet shall be furnished with a threaded meter swivel nut, with meter gasket, or flanged to match size of meter.
  - d. Ball valve shall be brass and shall seat watertight with flow in either direction.
  - e. Curb stop shall be furnished with padlock ring for locking valve in closed position.
  - f. Curb stop shall be model B-25172 as manufactured by Mueller Company or model 6100W as manufactured by A.Y. McDonald Manufacturing Co. or approved equal.
4. Service Fittings and Couplings: Service fittings and couplings shall conform to the requirements of AWWA C800.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Following pressure testing and disinfection of the water main and when directed by the Engineer, the Contractor shall install water taps for each service connection. All taps shall remain exposed at the main until the service line has been inspected, tested for pressure and disinfected.
- B. Locations of taps shall be as directed by the Engineer along the route of the water main.
- C. Installation of water service connections shall conform to the details shown on the Drawings.
- D. The Contractor shall be prepared to make emergency repairs to the water main, if necessary, due to damage caused by the Contractor's operations. In conjunction with this requirement, the Contractor shall furnish and have available at all times, a tapping machine, for the purpose of making temporary water service taps or emergency repairs to damaged water services. The Contractor shall furnish the Engineer a phone number of an individual with the authority to

initiate emergency repair work. The phone number shall be provided prior to starting work on the Project.

### **3.02 TAPPING WATER MAIN**

- A. All services connected to water main shall be through a direct tap.
- B. The water main shall be tapped with a tapping machine specifically designed for that purpose. The tap shall be a direct tap into the water main through a corporation stop. All taps shall be supervised by the Engineer. All taps shall be made on the water main at a position so as not to be on the top of the water main or on the bottom of the water main.
- C. The distance between taps shall be a minimum of 12-inches.

### **3.03 METER BOXES**

- A. Oval cast iron meter boxes with lids for installation with ¾-inch and 1-inch meters shall be furnished by the Owner as specified in Paragraph 1.04 of this Section.
- B. Rectangular cast iron meter box lids and frames for installation with 1 ½-inch and 2-inch meters shall be furnished by the Owner as specified in paragraph 1.04 of this Section. Meter boxes for 1 1/2-inch and 2-inch meters shall be furnished and installed by the Contractor.
- C. Meter boxes shall be installed by the Contractor in the locations as shown on the Drawings or as directed in the field by the Engineer.
- D. Meter box installation shall include valves, fittings and accessories to allow for future installation of meter and backflow preventer by the water utility.
- E. Meter boxes shall be located perpendicular to the curb. The street edge of the box shall be located 18-inches (maximum) behind the back of the curb and the meter lid shall be set at finished grade. The meter box shall be set on a bed of gravel. The gravel shall be 3-inches thick and extend 6-inches in all directions beyond the edge of the meter box.

### **3.04 SERVICE LINES**

- A. Copper tubing between tap and water meter shall be one continuous length of pipe with no intermediate joints or connections. The service line shall be placed without sharp turns or bends from the water main to the meter box.
- B. Size of new service connections shall as directed by the Engineer or as shown on the Drawings.
- C. New copper service lines shall be installed by free bore without a casing.

### **3.05 TRANSFER OF SERVICE**

- A. All service lines to be replaced or transferred shall be the same size as existed prior to construction.
- B. As shown schematically on the Drawings, new service lines shall be installed between the new main and the existing meter. If a new service line or the existing meter connection or fitting is

damaged during construction, it shall be abandoned and a new copper service line and meter connection and fitting will be installed at the Contractor's expense.

- C. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation cock shall be opened and all visible leaks shall be repaired and approved by the Engineer.
- D. Immediately before connecting to the existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line shall be provided by the Contractor.
- E. The existing service lines shall be abandoned in place at the corporation stop unless directed by the Engineer.

### **3.06 RELOCATION OF EXISTING METERS AND METER BOXES**

- A. Before disconnecting the existing meter, the existing corporation stop in the main shall be closed. All existing meters and meter boxes shall be removed, reinstalled and reconnected as indicated on the Drawings and as directed by the Engineer.
- B. Existing service lines shall be field located by the Contractor. The Contractor shall be responsible for locating existing meters and meter boxes, relocating the meters and meter boxes as directed by the Engineer and determining the existing size service line to reconnect the meters to the water mains. All service lines installed under existing pavement, including streets, driveways and sidewalks, shall be installed by free bore.
- C. The Contractor shall relocate the existing meter box and meter and reconnect the house service. Refer to paragraph 3.04A of this Section.

### **3.07 MAINTENANCE AND REPAIRS**

- A. The tap and service line shall remain under Contractor's maintenance responsibility for the same warranty period as the water main. The Contractor shall promptly repair any damage to the water main and service line during the warranty period.

**+ + + END OF SECTION 02668 + + +**

**SECTION 02675  
DISINFECTION OF WATER MAINS**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. The work covered by this Section includes furnishing all labor, equipment, materials, chemicals and incidentals required to disinfect all water mains installed under this contract in accordance with the procedures specified herein and as directed by the Engineer.

**1.02 QUALITY ASSURANCE**

- A. Reference Standards: Procedures for disinfecting water mains unless otherwise modified herein, shall conform to the requirements of AWWA Standard C651, Disinfecting Water Mains.

**1.03 SUBMITTALS**

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:
  - 1. Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written pipeline disinfection procedure for approval before being permitted to proceed with the disinfection. The plan shall also include the steps to be taken for the neutralization of the chlorinated water.
  - 2. In addition, for mains 24-inches in diameter and larger, the Contractor shall submit the resume of a Disinfection Supervisor. The Disinfection Supervisor shall have demonstrated prior disinfection experience with at least 10 miles of 24-inch diameter or greater water transmission mains in the state of Georgia. Approval of the Disinfection Supervisor shall also include a 1 hour interview with the Owner.

**PART 2 PRODUCTS**

**2.01 DISINFECTION AGENT**

- A. The disinfection agent shall be free chlorine or chlorine compound.

**PART 3 EXECUTION**

**3.01 DISINFECTION OF PIPELINE**

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feed method and these Specifications.
- B. Chlorination:
  - 1. Contractor shall meet the disinfection requirements of the current version of the Georgia Environmental Protection Division, Drinking Water Permitting & Engineering Program,

Minimum Standards for Public Water Systems, or the requirements below, whichever are more stringent.

2. Contractor shall apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours. Water shall be supplied from a temporary source protected by appropriate backflow prevention devices. Backflow preventer must be approved by the Owner prior to connection. Chlorine shall be injected no more than 10 feet from the beginning of the new main.
  3. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period.
  4. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.
  5. Final pipeline disinfection shall occur at the end of the construction period immediately prior to putting the main in service.
  6. Main disinfection shall be performed and evaluated in sequential and contiguous pipe sections between in-line valves.
- C. Disposal of Chlorinated Water: Reduce chlorine residual of disinfected water to less than 1 milligram per liter if discharged directly to a body of water or to less than 2 milligrams per liter if discharged onto ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize the chlorine residual. Flush all lines until residual is equal to existing system. Contractor shall be responsible for any state or local permits required for the disposal of flushing water.
- D. Bacteriological Testing: After final flushing and before the water main is placed in service, the Owner shall collect samples from the main and deliver them to the Owner's designated laboratory for bacteriological testing. One set of samples shall be collected from every 1,200 feet of water main, plus one set from each end of main. Testing shall be performed by the Owner's water laboratory. If test results are not satisfactory, the Contractor shall re-chlorinate the mains until required results are obtained.

**+++ END OF SECTION 02675 +++**

**SECTION 03301  
CONCRETE AND REINFORCING STEEL**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Contractor shall furnish all labor, materials, equipment and incidentals required to complete all cast-in-place concrete work as shown on the Drawings and as specified herein.
- B. Cast-in-place concrete shall be required for the following:
  - 1. Slabs
  - 2. Channels
  - 3. Curb and gutters
  - 4. Sidewalks
  - 5. Thrust Blocks
  - 6. Pipe encasement
  - 7. Miscellaneous structures

**1.02 SUBMITTALS**

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:
  - 1. Product data for all materials stating the location where product is to be used.
  - 2. Certification that materials meet the specifications.
  - 3. Manufacturer's application and installation instructions.
  - 4. Samples of waterstops, concrete roughener, joint fillers, caulk and bonding agent.
- B. Drawings and reinforcing schedules showing completed bending and placing details shall be submitted to the Engineer for approval as detailed in the General Conditions. No steel shall be fabricated until the drawings have been approved.
- C. If ready-mixed concrete is to be used, the manufacturer shall submit design mix for approval. Design mix shall indicate the dry proportions to be used, with evidence that these proportions will produce concrete of the quality specified.

**1.03 QUALITY ASSURANCE**

- A. Reference Standards: The Contractor shall comply with applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or specified herein.
1. ACI 301 - Specifications for Structural Concrete, Chapter 6, Joints and Embedded Items.
  2. ACI 305 – Hot Weather Concreting.
  3. ACI 306 – Cold Weather Concreting.
  4. ACI 347 – Guide to Formwork for Concrete
  5. ACI 350 - Environmental Engineering Concrete Structures, Chapter 2.8, Joints.
  6. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
  7. ASTM C33 - Standard Specification for Concrete Aggregates.
  8. ASTM C94 – Standard Specification for Ready-Mix Concrete.
  9. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Course Aggregates.
  10. ASTM C143 – Standard Test Method for Slump of Portland Cement Concrete.
  11. ASTM C150 – Standard Specification for Portland Cement.
  12. ASTM C309 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
  13. ASTM D1752 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- B. All manufactured items shall be installed in accordance with manufacturer's instructions.
- C. Construction and expansion joints shall not be added or relocated without the approval of the Engineer.

## **PART 2 PRODUCTS**

### **2.01 FORMS**

- A. Forms shall be free from roughness and imperfections and adequately braced and tied to prevent movement when concrete is placed. Wooden spreaders shall not be allowed in the concrete.
- B. Wire ties shall not be allowed. Metal ties or anchorages which are required in the forms shall be so constructed that the metal work can be removed for a depth of at least 1-inch from the surface of the concrete without injury to such surface by spalling or otherwise. Forms shall be thoroughly cleaned before using and shall be treated with oil or other approved materials

### **2.02 MATERIALS**

- A. Ready-Mixed Concrete:
  - 1. Truck-mixed, ready-mixed concrete shall conform to ASTM Designation C94 and the requirements herein, or as otherwise approved by the Engineer.
  - 2. Each load of ready-mixed concrete delivered to the job site shall be accompanied by a delivery ticket. Ticket shall show all information to substantiate pre-approved design mix.
- B. Cement shall be domestic Portland cement conforming to ASTM Designation C150, Type II.
- C. Aggregates
  - 1. General
    - a. Fine and coarse aggregates shall conform to ASTM C33 and shall be tested in accordance with ASTM C136, Aggregates shall be washed before use.
    - b. When sources of aggregates are changed, test reports shall be provided for the new material. The tests shall be performed prior to commencing concrete work.
  - 2. Coarse Aggregate: Coarse aggregate shall be hard, dense and durable gravel or crushed rock free from injurious amounts of soft and friable particles, alkali, organic matter and other deleterious substances. Gradation shall conform to ASTM C33.
  - 3. Fine Aggregate: Fine aggregate shall be hard dense durable particles of either sand or crushed stone graded from course to fine and shall conform to ASTM C33.
- D. Reinforcing steel shall be steel bars conforming to ASTM A615, Grade 60. Reinforcing steel shall be free from rust, scale, dirt grease and injurious contaminants. Rail steel bars shall not be permitted in the Work.
- E. Welded wire fabric shall conform to ASTM A185.
- F. Water for washing aggregate, for mixing and for curing shall be potable, clean and free from deleterious amounts of acids, alkalis, oils and organic materials.
- G. Waterstops shall be PVC (polyvinylchloride) meeting ASTM D638 test method for tensile strength of 2020 psi and ultimate elongation of 370.
  - 1. Construction Joints:
    - a. Serrated with center bulb, 3/8-inch thick by 6-inches minimum width, Greenstreak #706 or equal.
    - b. Preformed plastic adhesive waterstop, Synko-Flex Products or approved equal. Use only where shown on the Drawings.
  - 2. Expansion Joints: Serrated with center bulb, 3/8-inch thick by 9-inch minimum width, Greenstreak #738 or equal.

### **2.03 CONCRETE QUALITY**

- A. Unless otherwise specified or directed by the Engineer, concrete shall be designed for a minimum compressive strength of 3,000 psi at 28 days
- B. Concrete for encasements and fill shall have a minimum compressive strength of 1,500 psi at 28 days.

### **2.04 CONCRETE ADMIXTURES**

- A. Admixtures shall not be used unless approved by the Engineer.
- B. Do not use calcium chloride in concrete unless approved by the Engineer.
- C. Do not use a retarder in the concrete, unless approved by the Engineer.

### **2.05 CONCRETE CURING MATERIALS**

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M182, Class 3.
- B. Moisture-Retaining Cover shall conform to ASTM C171 and shall be:
  - 1. Waterproof paper.
  - 2. 4 mil polyethylene.
- C. Curing and Sealing Compound shall conform to ASTM C309 and shall be:
  - 1. Res-X curing compound as manufactured by the Burke Company.
  - 2. Masterkure as manufactured by Master Builders Company.
  - 3. Concrete Curing Compounds as manufactured by W. R. Meadows, Inc.
  - 4. Or approved equal.

## **PART 3 EXECUTION**

### **3.01 FORM WORK**

- A. Form work shall be installed in accordance with ACI 347.

### **3.02 REINFORCEMENT**

- A. Reinforcement shall be shipped to the site with bars of the same size and shape fastened in bundles with metal identification tags giving size and mark securely wired on. The identification tags shall be labeled with the same designation as shown on the submitted bar schedules and shop drawings.

- B. All bars shall be stored off the ground and shall be protected from moisture and kept free from dirt, oil or other injurious coatings.
- C. Reinforcement, where required, shall be accurately placed in exact positions as shown on the Drawings and shall be secured against displacement with annealed wire ties or suitable clips at intersections and shall have a clear space of 2-inches between the steel and the face of forms unless otherwise indicated.
- D. Wire ties passing through the forms for the purpose of holding the steel in proper position will not be allowed. Concrete blocks with wire ties cast therein may be used if approved by the Engineer for the purpose of maintaining and clearance between the reinforcement and the forms.
- E. Metal chairs shall not be used to support unit reinforcing in slabs. Instead, all reinforcing shall be supported on precast concrete blocks of the correct height. Supporting steel by means of cinder blocks or concrete building blocks will not be permitted.
- F. Unless otherwise shown, splices in reinforcement shall be lapped not less than 24 diameters. All bar splices shall be staggered whenever possible. When splicing bars of different diameters, the length of the lap shall be based on the larger bar.
- G. Before being placed in position, reinforcement shall be thoroughly cleaned of all loose mill and rust scale, dirt and other coatings, including ice, that reduce or destroy bond. Where there is delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.
- H. In no case shall any reinforcing steel be covered with concrete until the amount and position of the reinforcement have been checked by the Engineer and his permission given to proceed with the concreting.

### **3.03 MIXING CONCRETE**

- A. Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged. The mixer shall be rotated at a speed recommended by the mixer manufacturer and mixing shall be continued for at least 1-1/2 minutes after all materials are in the mixer. Concrete shall be placed within 1 ½ hours of the time at which water was first added, otherwise it shall be rejected. Concrete which has been remixed or retempered or to which an excess amount of water has been added shall also be rejected.
- B. Adding water in controlled amounts during the mixing cycle shall be done only under the direction of the Engineer.

### **3.04 PLACING CONCRETE**

- A. Concrete shall not be placed until forms and method of placement have been approved by the Engineer. Before depositing concrete, all debris, foreign matter dirt and water shall be removed from the forms. The surface of concrete previously placed such as a manhole base or horizontal construction joint shall be cleaned and brushed with cement paste. Concrete shall not be placed in water or submerged within 24 hours after placing, nor shall running water be permitted to flow over the surface of fresh concrete within 4 hours after its placing.

- B. High frequency mechanical vibrations shall be used as necessary to obtain consolidation of the concrete. Care shall be taken to avoid segregation of the aggregates by excessive vibration. Concrete adjacent to forms, reinforcing rods and around pipe stubs shall be carefully spaded or rodded.
- C. Placing Concrete in Hot Weather: In hot weather (above 85 degrees F), concrete shall be placed in accordance with ACI 305.
- D. Placing Concrete in Cold Weather: In cold weather (below 45 degrees F), concrete shall be placed in accordance with ACI 306.
- E. At the base of walls in manholes where construction joints are used, install waterstops.

### **3.05 WATERSTOPS**

- A. Waterstops for all joints shall be continuous around all corners and intersections. Splices shall be made by welding in accordance with the manufacturer's recommendations, subject to the approval of the Engineer.
- B. Drill holes in waterstops, just below the bulb and tie waterstops to reinforcing steel with steel tying wire as specified in this section.
- C. A sufficient number of ties shall be placed, as directed by the Engineer, to insure that waterstops will remain in the required position during concrete placement.

### **3.06 CONCRETE CRADLES, ARCHES AND ENCASEMENTS**

- A. Concrete cradles, arches and encasements shall be placed as shown on the Drawings and as directed by the Engineer. Backfill shall not be placed on the concrete until directed by the Engineer.
- B. Control joints shall be incorporated into the concrete as shown on the Drawings.
- C. The pipe shall be securely braced both vertically and horizontally to restrain it against flotation while pouring the concrete. Holes left in the concrete by cross braces during the pouring shall be completely filled with concrete as directed by the Engineer.

### **3.07 FINISH**

- A. Float finish shall be applied to surfaces of manhole inverts and shall conform to ACI 301. Floating shall be performed with a hand or power driven float. Floating shall compact and smooth the surface and close any cracks and checking of surfaces.

### **3.08 CURING AND SEALING**

- A. Concrete curing shall be completed by water curing or using a curing and sealing compound or by a combination of both methods. Repairs or treatment of concrete surfaces shall be coordinated so that interruption of the curing will not be necessary.

### **3.09 PROTECTION**

- A. Concrete shall be protected from injurious action by sun, rain, flowing water, frost and mechanical injury.

### **3.10 REMOVAL OF FORMS**

- A. Forms shall not be removed without the approval of the Engineer. With an average temperature of 50 degrees F or higher, inside forms shall be retained for at least 48 hours and outside forms for at least 24 hours. With lower temperatures, forms shall be retained one day longer.

**+++ END OF SECTION 03301 +++**

**SECTION 04000  
MASONRY**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. Furnish all labor, materials, equipment and incidentals required to construct all masonry work as shown on the Drawings and specified herein.
- B. The work under this Section includes, but is not necessarily limited to, the following:
  - 1. Concrete masonry units (CMU)
  - 2. Common brick for back up work
  - 3. Masonry reinforcing, ties and anchors
  - 4. Patching existing brick masonry removed or damaged during construction
  - 5. Grouting required throughout the project

**1.02 SUBMITTALS**

- A. Submit two samples each of concrete masonry units.
- B. Masonry Mortar: Submit manufacturer's specifications and Instructions for each manufactured product. Indicate that a copy of each applicable instruction has been distributed to the Masonry Installer if other than the Contractor.

**1.03 QUALITY ASSURANCE**

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards except as otherwise shown on the Drawings or specified herein.
  - 1. ASTM C62 – Standard Specification for Building Brick (Clay or Shale).
  - 2. ASTM C90 – Standard Specification for Load Bearing Concrete Masonry Units.
  - 3. ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
  - 4. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
  - 5. ASTM C150 – Standard Specification for Portland Cement.
  - 6. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
  - 7. ASTM C270 – Standard Specification for Mortar for Unit Masonry.

8. ASTM C404 – Standard Specification for Aggregates for Masonry Grout.
9. ASTM C426 – Standard Specification for linear Drying Shrinkage of Concrete Masonry Units.
10. ASTM C476 – Standard Specification for Grout for Masonry.
11. NCMA – National Concrete Masonry Association.

B. (Not Used)

#### **1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. All perishable materials for the work of this Section shall be delivered, stored, and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.
- B. All masonry shall be shipped, stacked with hay or straw protection or other suitable protective device, and shall be similarly stacked off the ground on the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering approved by the Engineer.
- C. Mason's sand shall be protected during shipping, storage and while on the job site to prevent contamination.

#### **1.05 COLD WEATHER CONSTRUCTION**

- A. Masonry construction in cold weather shall conform to the applicable requirements of "Cold Weather Concrete Masonry" of the National Concrete Masonry Association (NCMA).
- B. (Not Used)

#### **1.06 WARRANTY**

- A. Provide a warranty against defective equipment and workmanship in accordance with the requirements of the General Conditions of the Contract Documents.
- B. (Not Used)

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Concrete Masonry Units:
  1. Concrete masonry units (CMU) shall conform to ASTM C90, light weight, Grade N, Type I, hollow, load bearing units of 8-inch x 16-inch nominal face size. All exposed vertical corners shall be bull nosed.

2. CMU shall be free from substances that will cause staining or pop-outs, and shall be fine, even texture with straight and true edges. All units shall have been cured in an autoclave in an atmosphere steam at a pressure and temperature of approximately 150 psig. and 360 deg. F. Units shall have a maximum linear drying shrinkage of 0.25 percent (ASTM C426) and have a moisture content of time of delivery not exceeding 30 percent of total absorption.
3. Units shall be obtained from one manufacturer to insure even color and texture.

B. Brick:

1. Common brick shall conform to the requirements of ASTM C62.
2. (Not Used)

**2.02 REINFORCING, TIES, ANCHORS AND MISCELLANEOUS**

- A. Wire joint reinforcement shall be welded wire units prefabricated in straight lengths of not less than 10 ft. with matching corner and tee units fabricated from cold-drawn steel wire complying with ASTM A82, with deformed continuous side rods and plain cross-rods, crimped for cavity wall construction.
- B. Single wythe reinforcement shall be truss type, fabricated with single pair of galvanized 9 gauge side rods and continuous 9 gauge diagonal cross-rods spaced not more than 16 -inch O.C.
- C. Reinforcing designated No. 3 and larger shall be deformed steel bars as specified in Section 03301.
- D. The Contractor shall provide and install miscellaneous anchors and attachment members, required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.
- E. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

**2.03 MORTAR MATERIALS**

- A. Portland cement shall conform to ASTM C150 Type II.
- B. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.
- C. Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to the limits of ASTM C144. Sand for grout shall conform to ASTM C144 or C33 as required.
- D. Water shall be free from injurious amounts of oils, acids, alkalis or organic matter, and shall be clean and fresh.
- E. Mortar shall conform to ASTM C270, Type S, consisting of 1 part portland cement, 1/2 part lime, 4-1/2 parts sand, or as otherwise approved by the Engineer. Ingredients shall be accurately

measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed.

## **2.04 GROUT MATERIALS**

- A. Grout for CMU course and cells shall be the course type in conformance with ASTM C476.
- B. Aggregates for grout, except non-shrink grout, shall consist of inert natural sand and coarse aggregate in conformance with ASTM C404.
- C. Cement, lime and water shall be as specified above for mortar materials.
- D. Grout for setting bearing plates, machinery, or any other equipment shall be mixed as recommended by the manufacturer to give the necessary consistency for placing and to give a minimum compressive strength of three thousand lbs. per square inch in three days.
- E. All other grout shall be one part portland cement and one part sand.
- F. Non-shrink grout shall utilize Embeco Aggregates as manufactured by the Master Builders Company, Ferrolith by Sonneborn, or equal and be proportioned with sand in strict accordance with the manufacturer's instructions for the use intended.

## **PART 3 EXECUTION**

### **3.01 MORTAR AND GROUT**

- A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than five minutes, approximately two minutes of which shall be used for mixing the dry materials and not less than three minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring a lime content, the contractor will have the option of using the dry-mix method or first converting the hydrated lime into a putty.
- B. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious material has been thoroughly distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.
- C. Mortar boxes shall be cleaned out at the end of each day's work, and all tools shall be kept clean. Mortar that has begun to set shall not be used.
- D. Grout for CMU courses and cells shall be machine mixed in an approved type of mixer. All cementitious materials shall be mixed for a minimum period of five minutes, after all materials are placed in the mixer, with the amount of water to produce a minimum eight inch slump.

### **3.02 MASONRY INSTALLATION**

- A. No material which is frozen or covered with frost or snow shall be used in the construction, and no antifreeze salts or ingredients shall be mixed with the mortar. Masonry shall not be laid at temperatures below forty degree F and all work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated

that the temperature at the surface will not fall below fifty degrees F for a period of seventy-two hours after placing. Any completed work found to be affected by freezing shall be taken down and rebuilt by the Contractor at his expense.

- B. All bricks shall be laid in full beds of mortar with shoved joints and with all joints slushed solidly in each course. Bond shall be common bond. Brick with more than eight percent absorption shall be damp when laid, except in freezing weather. All brickwork shall be laid up from an outside scaffold and shall be carried up simultaneously at an approximate level. No brick shall be laid overhand. Face bricks receiving minor handling defects shall be used in nonconspicuous surfaces. Distribution of light and dark bricks shall be as even as possible.
- C. All CMU shall be laid in a full mortar bedding applied to the entire horizontal face of the masonry unit. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well-compacted vertical mortar joint for the full shell thickness. Units shall set with all cells in a vertical position. The moisture content of the units when laid shall not exceed thirty-five percent of the total absorption as determined by laboratory test.
- D. All masonry units shall be laid in stretcher (running) bond unless otherwise shown. Tool dense and neat.
- E. Sizes shall be as specified and called for on the Drawings, and where "soaps" and "splits" are used, the space between these members and the backup material shall be slushed full of mortar.
- F. Joints of all masonry shall be tooled in accordance with the following:
  - 1. Wait until unit mortar is thumb-print hard before tooling joint. This may require as much as three hours in the shade and one hour in the sun in the summertime.
  - 2. The required personnel of the Contractor shall be kept on the job after hours, if necessary, to properly tool joints.
  - 3. Both vertical and horizontal joints shall be maintained uniform in spacing.
  - 4. Joints for CMU shall be 3/8-inch.
- G. Surfaces shall be brushed as work progresses and maintained as clean as it is practical. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind, and before continuing, work previously laid shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by the elements by means of waterproof paper, tarpaulins, or boards.
- H. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
- I. All ties and reinforcing for masonry shall be furnished and installed by the Contractor. Grout solid all courses and cells which are reinforced. Place joint reinforcing (fully embedded in mortar) at 16 inches maximum vertically and lap 6 inches between lengths and corner and tee pieces.

- J. Bed and grout all steel, for equipment and machinery, and items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates, and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

### **3.03 CLEANING**

- A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and repointed with mortar of same color as that of the original and adjoining work.
- B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.
- C. All masonry shall be cleaned with approved detergent solution in accordance with manufacturers printed directions. No acid or metal scrapers shall be used on masonry.

**+++ END OF SECTION 04000 +++**

**SECTION 15100  
VALVES AND APPURTENANCES**

**PART 1 GENERAL**

**1.01 SCOPE**

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. Items included under this Section are:
  - 1. Gate Valves
  - 2. Butterfly Valves
  - 3. Insert Valves
  - 4. Valve Boxes
  - 5. Tapping Sleeves and Gate Valves
  - 6. Meter Box Sampling Station
  - 7. Flange Insulating Gasket Kits
  - 8. Electronic Locating and Marking Systems

**1.02 DESCRIPTION OF SYSTEMS**

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water.

**1.03 QUALITY ASSURANCE**

- B. Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or otherwise specified.
  - 1. ANSI/AWWA C504 – Rubber-Seated Butterfly Valves
  - 2. ANSI/AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
  - 3. ANSI/AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
  - 4. ANSI/AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.
  - 5. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

6. ANSI/NSF Standard 61 – Drinking Water System Components – Health Effects

**1.04 SUBMITTALS**

- A. Submittals shall be in compliance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:
  - 1. Complete shop drawings of all valves and appurtenances
  - 2. Manufacturer’s certificate certifying that the products meet or exceed the specified requirements.

**1.05 TOOLS**

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A. All valves and appurtenances shall be of the size shown on the Drawings and all equipment of the same type shall be from one manufacturer.
- B. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

**2.02 GATE VALVES (GV)**

- A. 20-Inches in Diameter and Smaller:
  - 1. Gate valves shall be resilient seated type conforming to the requirements of AWWA C509 or AWWA C515.
  - 2. Valves shall have a minimum working pressure of 250 psi.
  - 3. Valve manufacturer shall submit an affidavit to the Engineer indicating valve compliance with all applicable AWWA standards.
  - 4. Valves less than 4-inches in diameter shall have threaded ends. Larger valves shall be mechanical joint unless shown otherwise on the Drawings.
  - 5. Valve shall be non-rising stem type with a 2-inch square operating nut and shall open right (clockwise).
  - 6. All internal and external ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall conform to ANSI/AWWA C550 and shall be applied electrostatically prior to assembly. Epoxy shall be NSF61 approved.

7. Valve shall have a ductile iron body, bonnet and stuffing box. All joints between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be supplied with o-ring seals.
8. Valve wedges shall be symmetrical, made of ductile iron and totally encapsulated in rubber. Rubber shall be permanently bonded to the wedge per ASTM D429.
9. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.

B. 24-Inches in Diameter and Larger:

1. Gate valves shall be resilient seated type conforming to the requirements of AWWA C509 or AWWA C515.
2. Valves shall have a minimum working pressure of 250 psi.
3. Valve manufacturer shall submit an affidavit to the Engineer indicating valve compliance with all applicable AWWA standards.
4. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type operator.
5. Valve ends shall be mechanical joint type except where restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
6. Valve shall be non-rising stem type with a 2-inch square operating nut and shall open right (clockwise).
7. All internal and external ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall conform to ANSI/AWWA C550 and shall be applied electrostatically prior to assembly. Epoxy shall be NSF61 approved.
8. Valve shall have a ductile iron body, bonnet and stuffing box. All joints between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be supplied with o-ring seals.
9. Valve wedge shall be symmetrical, made of ductile iron and totally encapsulated in rubber. Rubber shall be permanently bonded to the wedge per ASTM D429.
10. Valves shall be non-rising stem type with a 2-inch square operating nut and shall open right (clockwise).
11. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.

**2.03 BUTTERFLY VALVES (BV)**

B. Class 150 Valves:

1. Class 150 butterfly valves shall be short body design and shall be designed, manufactured and tested in accordance with the requirements of ANSI/AWWA C504 for Class 150B butterfly valves.
2. Valve bodies shall be ductile iron conforming to ASTM A536, Grade 65-45-12 or ASTM A126,

Grade B cast iron. Shafts shall be ASTM A276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron.

3. The valve shall have a resilient seat.

C. Class 250 Valves:

1. Class 250 butterfly valves shall be short body design and shall be designed, manufactured, and tested in accordance with the requirements of ANSI/AWWA C504 for class 250B butterfly valves.
2. Valve bodies shall be ductile iron conforming to ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Shafts and shaft hardware shall be ASTM A564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12.
3. The valve shall have a resilient seat.
4. ANSI/AWWA C504 Section 5.1 testing requirements for class 250 valves shall be modified as follows:
  - a. The leakage test shall be performed at a pressure of 250 psi.
  - b. The hydrostatic test shall be performed at a pressure of 500 psi.
  - c. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the Engineer.

C. 24-inch and larger valves shall have a resilient seat that is located either on the valve disc or in the valve body. The valve seat shall be fully field adjustable and field replaceable.

D. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

E. Actuators

1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured and tested in accordance with ANSI/AWWA C504. Actuators shall be capable of holding the valve disc in any position between full open and full closed without any movement or fluttering of the disc.
2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices to prevent over travel of the valve disc in the open and closed positions. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
3. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.

F. The valve actuator shall be factory mounted on the valve by the valve manufacturer and shipped to the project site as a complete operating unit. Valve shall be designed to open right

(counterclockwise).

- G. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown on the Drawings. Flange joints shall meet the requirements of ANSI B16.1, Class 125.
- H. Butterfly valves shall be manufactured by Mueller, Pratt or DeZurik.

**2.04 BYPASS VALVES AND PIPING**

- A. Where shown on the Drawings, valves 24-inches in diameter and larger shall be installed with bypass piping and valve as specified in the following table:

Valve Diameter (Inches)	Bypass Valve and Pipe Diameter (Inches)
24	4
30	4
36	6
42	6
48	8
54	8
60	10

**2.05 INSERT VALVES (IV)**

- A. Insert valves shall be a resilient seat wedge gate valve. Valve design shall allow the valve to be installed in an existing pressurized pipeline.
- B. The valve shall have a ductile iron body, bonnet and wedge suitable for a design working pressure of 250 psi. Valve shall meet the requirements of ANSI/AWWA C515. Ductile iron shall meet the requirements of ASTM A536, Grade 65-45-12.
- C. Valves 12-inches and smaller shall be capable of working on cast iron or ductile iron, class A, B, C and D pipe diameters without changing either top or bottom portion of the split valve assembly.
- D. Resilient Wedge Gate Assembly
  1. The construction of the resilient wedge shall comply with ANSI/AWWA C509.
  2. The ductile iron wedge shall be fully encapsulated with EPDM rubber by a high pressure and high temperature compression or injection mold process. There shall be no exposed trim.
  3. The resilient wedge shall seat on the valve body and not on the pipe to obtain the maximum seating and flow control results. The resilient wedge shall be totally independent of the carrier pipe. The resilient wedge shall not come into contact with the carrier pipe or depend on the carrier pipe to create a seal.
  4. Pressure equalization on the downstream or upstream side of the closed wedge shall not be necessary to open the valve.
  5. The wedge shall be symmetrical and seal equally well with flow in both directions.

6. The resilient wedge shall ride inside the body channels to maintain wedge alignment throughout its travel to achieve maximum fluid control regardless of high or low flow pressure or velocity. The resilient wedge shall have more support than the operating stem as the resilient wedge enters and exits the water way.
7. Valve shall have an oversized and unobstructed flow way.

E. Fusion Bonded Epoxy

1. The insert valve shall be fully epoxy coated on the interior and exterior. The fusion bonded coating shall be applied prior to assembly so that all bolt holes and body-to-bonnet flange surfaces are fully epoxy coated.
2. Valve shall be coated with a minimum of 8 mils epoxy in compliance with ANSI/AWWA C550 and certified to ANSI/NSF 61.

F. Gaskets and Triple O-ring Seals

1. The insert valve shall have triple o-ring stem seals. Two o-rings shall be located above and one o-ring located below the thrust collar.
2. The lower two o-rings shall provide a permanently sealed lubrication chamber. The upper o-ring shall insure that sand, dirt or grit cannot enter the valve to cause damage to the lower o-rings.
3. Side flange seals shall be of the o-ring type of either round, oval or rectangular cross-sectional shape.

G. Valve Stem and Thrust Washers

1. The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of ANSI/AWWA C515
2. The stem shall have an integral thrust collar in accordance with Section 4.4.5.3 of ANSI/AWWA C515. Two piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and shall be held in place on three sides by the wedge to prevent possible misalignment.
3. Two thrust washers shall be used One shall be located above the stem thrust collar and the other below the stem collar.
4. The stem shall be non-rising type with AWWA standard turns.
5. Valve operating nut shall be 2-inches square in accordance with ASTM A126, Class B. Valve shall open right (clockwise)

H. Hardware: Hardware materials shall develop the physical strength characteristics of ASTM A307 with dimensions conforming to ANSI B18.2.1

I. Split Restraint Devices: Split restraint devices shall be as specified in Section 02665.

J. The stuffing box, operating stem and resilient wedge (complete bonnet and moving parts)

shall be removable and replaceable under pressure.

## **2.06 VALVE BOXES (VB) AND EXTENSION STEMS**

- A. All buried valves shall be equipped with valve boxes and lids unless access to the valve operator is provided by a manhole or vault.
- B. Valve boxes shall be gray cast iron two-piece screw type with drop lids. Valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall have a five and one quarter (5-1/4) inch inside diameter. Valve boxes shall be of sufficient length that the bottom flange of the lower belled portion of the box is below the valve operating nut. Cast iron risers shall be provided as necessary. Valve boxes shall be model 8550 as manufactured by East Jordan Iron Works or equal.
- C. Valve box lids shall be gray cast iron and shall have "WATER" cast into the top of the lid in 3/4-inch (minimum) raised letters. Valve box lids shall weigh a minimum of 13 pounds. Valve box lids shall be model 6800 as manufactured by East Jordan Iron Works or equal.
- D. Valve boxes, risers and lids shall be coated with black asphalt.
- E. All valves shall be furnished with extension stems if operating nut is greater than four feet deep, to bring the operating nut to within 24-inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be stainless steel and shall be furnished by the valve manufacturer. Extension stems shall be sized by the valve manufacturer to withstand the maximum valve operator output.
- F. Where pavement exists, the box shall be adjusted to finished grade. When valves are located out of pavement, the box shall be adjusted to finished grade and a concrete pad shall be poured around the box as detailed on the Drawings.
- G. Stem guides shall be fully adjustable stem guides with bronze bushings, and shall be furnished by the valve manufacturer. Stem guides shall be installed as shown on the Drawings and shall conform to the extension guide spacing requirements as specified in AWWA/ANSI C501.

## **2.07 WRENCHES**

- A. Four tee handled wrenches of suitable length shall be furnished to operate all valves.

## **2.08 VALVE MARKERS (VM)**

- A. For installed valves, the Contractor shall furnish and install a concrete valve marker as detailed on the Drawings when directed by the Engineer, except on hydrant isolation valves. Valve markers shall be stamped "WATER".

## **2.09 TAPPING SLEEVES AND GATE VALVES (TS&V)**

- A. Tapping sleeves for mains 12-inches in diameter and smaller shall be ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be equal to Mueller H-615.
- B. Tapping sleeves for mains larger than 12-inches shall be of all stainless steel construction.

- C. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. The tapping sleeve shall be rated for 250 psi. working pressure
- D. Valves shall be gate valves as specified in Paragraph 2.02 of this Section, with a flanged connection to the tapping sleeve and a mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer.

**2.10 METER BOX SAMPLING STATION**

- A. Sampling station shall be meter box, retrofit style. Inlet and outlet connections shall be standard ¾-inch meter threads. The station shall consist of a standard meter resetter with the inlet leading up through the water system's residential meter, through a check valve and then out an outlet.
- B. The sampling station shall consist of a ½-inch lockable shut off valve leading to a valve riser and a 3/8-inch male quick disconnect valve. The valve and riser shall be positioned directly in line with the meter setter to avoid turning of the entire sampling station when pushing the sampling rod down on the valve.
- C. Sampling station parts shall be brass.
- D. Sampling station shall be furnished with a plastic PVC push on cap to protect the quick disconnect valve when not in use. The cap shall be sealed watertight with an o-ring below the quick disconnect valve.
- E. A portable sampling rod shall also be provided with each sampling station. The sampling rod shall be furnished with a female inlet which shall couple to the male quick coupling, and a quarter turn valve. The rod shall be brass and shall have two outlets, one for flushing and the other for sampling.
- F. The meter box sampling station and portable sampling rod shall be equal to Kupferle Foundry Company, Model 94WM

**2.11 FLANGE INSULATION GASKET KITS**

- A. Flange insulating gasket kits shall be installed as required to isolate dissimilar metals when connecting to pipelines of different metal composition.
- B. Flange kits shall consist of insulation gaskets, insulating sleeves and washers, nuts and bolts.

**2.12 ELECTRONIC LOCATING AND MARKING SYSTEMS**

- A. The Contractor shall furnish and install an electronic locating and marking system for all buried water main piping. System shall consist of electronic markers buried above the water main and stand-alone locators.
- B. The marker shall contain an antenna or three orthogonal tuned circuits. Electronic ball markers shall be made of high strength 4 1/2-inch (maximum) diameter plastic. Electronic ball markers shall be 3M EMS model 1403-XR as manufactured by 3M, Omni Markers as manufactured by Tempo or approved equal.
- C. Full range markers shall be equal to EMS model 1252 as manufactured by 3M or approved equal.

- D. The Contractor shall also furnish two (2) 3M Dynatel locators. Locators shall be 3M model 2250M-ID/UU3W-RT or approved equal.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.
- B. Buried flanged or mechanical joints shall be made with cadmium plated bolts.
- C. Prior to installation, valves shall be inspected for direction of opening clockwise, number of turns to open, freedom of operation, tightness of pressure containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the Engineer. Valves shall be closed before being installed.

#### **3.02 LAYING AND JOINTING VALVES AND APPURTENANCES**

- A. Valves, fittings, plugs, and caps shall be set and joined to the pipe in accordance with the manufacturer's recommendations for cleaning, laying and joining pipe. Twelve (12) inch and larger valves shall be provided with special support, such as crushed stone, concrete pads or a tamped trench bottom so that the pipe will not be required to support the weight of the valve.
- B. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
- C. A valve box shall be provided on each buried valve. The valve box shall be set over the center of the valve operating nut and plumbed. The box shall not transmit shock or stress to the valve. The bottom portion of the lower belled portion of the box shall be placed below the valve operating nut. The flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surrounding surface or such other level as directed by the Engineer.
- D. Underground valves shall be installed in vaults where indicated on the Drawings. The vault shall be precast or cast-in-place concrete as indicated on the Drawings. The valve box shall not transmit shock or stress to the valve and shall be as detailed on the Drawings. The valve vault cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.
- E. Settlement Joints: The first joint on all pipe connected to and outside of a valve vault shall be designed to allow differential settlement. The following joints will be allowed for settlement:
  - 1. Steel Pipe shall use a bolted, sleeve style coupling with joint harness as specified in AWWA M11.
  - 2. Ductile iron pipe shall use standard gasketed joints if unrestrained, or mechanically restrained gasketed joints if required by thrust restraint design.

- F. Pipe within 20 feet of each side of a direct-buried butterfly valve shall be protected from vertical deflection to protect proper function of butterfly valve. Vertical deflection of pipe shall be limited to butterfly valve manufacturer recommendation.

**3.03 BLOW-OFFS**

- A. Blow-offs shall be installed in locations as directed by the Engineer and as shown on the Drawings. Blow-offs shall not be connected to any sewer, submerged in any stream or creek, or be installed in any manner that will permit back siphonage into the water distribution system.

**3.04 ELECTRONIC LOCATING AND MARKING SYSTEM**

- A. The Contractor shall install a ball marker at each bend, tee, valve and 500 feet of pipe length installed.
- B. Ball markers shall be installed at a maximum depth of 5 feet.
- C. Ball markers shall be secured to the pipe with cable ties as shown on the Drawings and shall be installed in accordance with the manufacturer's instructions.
- D. Full range markers shall be installed on bends, tees, valves and pipe with 5-feet of cover or greater.

**3.05 TESTING**

- A. After installation, all valves and appurtenances shall be tested at least 1 hour at 250 psi, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the Engineer.

+++ END OF SECTION 15100 +++

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**SPECIAL PROVISION**

**PROJECT: CSCMQ-0007-00(096)  
FULTON COUNTY  
P.I. NO.: 0007096**

**Section 937 - Detection Systems**

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**937.1 General Description**

This work includes the procurement and installation of a detection system as shown in the plans. Ensure the detection system is capable of traffic data collection meeting the general and specific requirements of this specification. Ensure the firmware and software furnished and installed as part of an Intelligent Transportation System (ITS) project are the most current and approved releases or versions, unless otherwise requested by the Department. Provide all equipment, materials, and work in accordance with all manufacturers' recommendations. All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully interoperate with all other system components.

**A. Video Detection System (VDS)**

Provide an IP/Ethernet video detection system which provides presence detection, vehicle counts, roadway occupancy, vehicle classification, and speed information to the Department's central ITS management software. The video detection system shall be able to provide a minimum of three programmable vehicle classifications. The video detection system shall be able to detect in both high speed freeway and intersection presence modes. The intersection presence Video Detection System processor type shall be used for detecting traffic signal and/or ramp meter controllers in a traffic signal or ramp meter cabinet with card rack vehicle detector input files. Video detection systems operating in a traffic signal installation shall not be required to provide occupancy or classification data. The freeway video detection system shall include all necessary rack enclosures to house the video processor. The video detection system includes, but is not limited to, camera image sensor(s), including the detector housing, mounting hardware, an application programming interface (API) and protocol for system communications, a video detection system processor, central and local system management software, cabling between the detector and the cabinet, surge suppressors, terminations, output expansion modules which mount in the traffic signal controller cabinet input files, vertical conduit, weatherheads and related equipment. The video detection system processors shall communicate through an Ethernet interface and TCP/IP (transmission control protocol/Internet protocol) connection to multiple Transportation Management Center (TMC) computers. The detection video shall be encoded within the VDS processor to MPEG4 digital video format and be able to be viewed at the TMC without the use of external encoders.

**B. Microwave Vehicle Detection System (MVDS)**

Provide a high resolution microwave radar detection system which provides presence detection, vehicle counts, classification, occupancy, and speed information to the Department's central ITS management software. The

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microwave radar detection system includes, but is not limited to, microwave/ radar detectors, including detector housing, mounting hardware, an application programming interface (API) and protocol for system communications, system management software, cabling between the microwave detector(s) and the cabinet, surge suppressors, terminations, and related equipment. The high resolution Microwave Vehicle Detection System shall be able to emulate single or dual zone loop detectors and be able to detect a minimum of 10 lanes with a range of up to 250 feet away. These microwave detection systems are typically used for gathering near real-time information about the flow of traffic on freeways, highways, or other designated roadway types. The MVDS shall be provided with all necessary cabling, surge protection devices and modules for local serial and IP/Ethernet communications.

**C. Wireless Magnetometer Vehicle Detection (WMVD)**

Provide a wireless in-pavement magnetometer system for use in both freeway and intersection applications. The detection system shall provide accurate vehicle count, occupancy and speed information, as well as presence/stop bar applications, as needed. The battery-powered wireless sensor shall consist of a magnetometer capable of low-power radio communications to a roadside transceiver, packaged in a small, hardened plastic case, suitable for in-pavement mounting. The sensors shall detect changes in the earth's magnetic field to determine the presence or absence of vehicles, relative to the detection zone. Detection 'events' are transmitted via wireless radio communications to a wired access point connected to the control cabinet. The wired access point shall utilize IP/Ethernet communication. The system includes, but is not limited to battery operated wireless sensors, battery operated wireless repeaters, wired access points with respective radios, mounting hardware, cabling, surge protection devices, jumper cables and all items necessary for a complete WMVD installation.

**D. Short-Range Radio Device Detection System**

Provide a Short-Range Radio Device detection system in which a roadside monitoring unit continually and passively listens for Short-Range Radio enabled devices that broadcast their BDADDR (or BADDR), also referred to as the MAC address. The addresses shall be passively collected in order to get vehicle probe data for use in determining travel time along a route. These devices shall not have the ability to correlate a MAC address with personal information, such as subscriber names and/or vehicle ownership information. This type of detection system shall not be used to collect highly accurate volume and occupancy of a roadway, but rather collect a sampling of vehicles in order to derive approximate speeds and travel time for a corridor. Provide separate, powered and surge protected enclosures for the Bluetooth™ modules so that they may be installed in various cabinet types. All modules shall utilize IP/Ethernet communications, or cell modem by Type. The system includes, but is not limited to the Short-Range Radio Device processor, antenna, power supplies, mounting hardware, cabling, surge protection devices, jumper cables and all items necessary for a complete installation.

**937.1.01 Definitions**

General Provisions 101 through 150

**937.1.02 Related References**

**A. Standard Specifications**

Section 150 – Traffic Control

Section 639 – Strain Poles for Overhead Sign and Signal Assemblies

Section 647 – Traffic Signal Installation

Section 922 – Electrical Wire and Cable

Section 925 – Traffic Signal Equipment

Section 939 – Communication and Electronics Equipment

Section 940 – NaviGator Advanced Transportation Management System Integration

**B. Referenced Documents**

American National Standards Institute (ANSI)

American Society of Testing and Materials (ASTM)

EIA-170A

Electronic Industries Association (EIA) – 170A

FCC Part 15, Subparts J and B

National Electric Code (NEC) 210-19a., FPN No. 4

National Electrical Manufacturers Association (NEMA) TS1-1989 (R1994, R2000, R2005), Section 2.1.5.2, Section 2.1.12

NEMA TS-1-1989 (R1994, R2000, R2005)

NEMA TS2-2003 Type 2, Type 170 and Type 179 Standards

NEMA 250 Type 4 enclosure standards

Underwriter's Laboratory Incorporated (UL) Submittals

**937.1.03 Submittals**

The following charts provide the Contractor with an outline of the submittal requirements for the equipment and components for the following pay items. This chart is to be used as a guide and does not relieve the Contractor from submitting additional information to form a complete submittal package. Provide submittal data for all equipment, materials, test procedures, and routine maintenance procedures required for these items as required in these Specifications.

**SUBMITTAL REQUIREMENTS TABLE**

Material	Specification Reference	Catalog Cut Cuts	Mfg Detail. Specification	Shop Drng Drawings	Lab Test Report	Installation Proced.	Mainten. Proced.	Test Plan	Test Reports	Training Schedule	Warranty	Submittal Due Date (Calendar Days after NTP)
<b>Video Detection System</b>												
Video Camera & Programming	937.2.01	X	X		X	X	X	X	X			60 Days
Processor Module	937.2.01	X	X	X	X	X	X	X				60 Days
Cabinet Output Module	937.2.01	X	X	X	X	X	X	X				60 Days
Central Configuration	937.2.01	X	X			X	X	X	X			60 Days
Surge Protection	937.2.01	X	X	X		X	X	X	X			60 Days
Wiring, Cabling & Training Plan &	937.2.01	X	X	X		X	X	X	X			60 Days
	937.3									X	X	60 Days
<b>Microwave Vehicle Detection System</b>												
Microwave Detector	937.2.02	X	X	X	X	X	X	X	X			60 Days
Terminal Blocks & Surge Protection	937.2.02	X	X	X	X	X	X	X	X			60 Days
Wiring, Cabling & Training Plan &	937.2.02	X	X			X						60 Days
	937.3									X	X	60 Days
<b>Wireless Magnetometer Vehicle Detection</b>												
Sensor	937.2.03	X	X	X	X	X	X	X	X			60 Days
Serial Port Protocol	937.2.03	Xqq	X			X	X	X	X			60 Days
Wireless Repeater	937.2.03	Xqq	X			X	X	X	X			60 Days
Access Point Contact	937.2.03	X	X	X	X	X	X	X	X			60 Days
Extension Contact	937.2.03	Xqq	X			X	X	X	X			60 Days
Isolation (Surge	937.2.03	X	X	X	X	X	X	X	X			60 Days
Input/Output Module	937.2.03	Xqq	X			X	X	X	X			60 Days
Training Plan & Warranty Details	937.3									X	X	60 Days
<b>Short-Range Radio Device Detection System</b>												
Short-Range Radio Device Detection	937.2.04	X	X	X	X	X	X	X	X			60 Days
Short-Range Radio Device Support Data	937.2.04	X				X	X	X				60 Days
Training Plan & Warranty Details	937.3									X	X	60 Days

For each applicable vehicle detection system, submit to the Engineer for approval, two (2) hard copies and one (1) electronic copy of the manufacturer's descriptive literature (catalog cuts), technical data, operational documentation, service and maintenance documentation and all other materials required within these specifications. Electronic documents shall be placed on a CD as Adobe® pdf documents and delivered to the Engineer.

Products appearing on the Qualified Products List (QPL) that comply with these specifications are exempt from normal submittal requirements and pre-installation testing. These products have been evaluated by the Office of Traffic Operations and have proven their capability of meeting the appropriate Georgia Department of Transportation Specification. Any of these products may be used without submitting catalogue cuts, sampling or pre-testing. The

Contractor shall submit a letter to the Field Engineer, stating which QPL items they will use. The Field Engineer and/or department designee must ascertain that the construction item is the same material identified on the appropriate QPL and will acknowledge receipt of these items in the project diary or as required by the Construction manual.

Provide as-built documentation of all detector installations after the completion of acceptance testing.

## 937.2 Materials

### 937.2.01 Video Detection System

Use a video camera sensor that is compatible with the video detection system processor and meets the following technical and functional requirements:

#### A. Requirements

##### 1. Video Camera Sensor Type A

Furnish and install a video camera sensor that is compatible with both freeway and arterial video applications, and compatible with the required detection processor type. Send a video signal from the video camera sensor to the processor, using high resolution, video camera sensors as the primary video source for real-time vehicle detection. Utilize high-sensitivity optics in the video camera sensor to compensate for variations in lighting conditions, including blooming at night caused by headlights and minor vibration caused by wind. Include a heater at the front of the enclosure to prevent the formation of ice and condensation in cold weather. Ensure that the heater does not interfere with the operation of the video camera sensor electronics, or cause interference with the video signal, where applicable. As a minimum, meet the following requirements for each video camera sensor assembly installation:

- a. Use a 1/4" to 1" color interline or frame transfer charge coupled device (CCD).
- b. Signal to Noise Ratio shall be greater than 47 dB
- c. The video standard should be compliant with National Television System Committee (NTSC) Standard, RS-170A Compliant (available as EIA-170A specification)
- d. Provide a lens with a minimum 18X zoom. Zoom and camera controls shall be over the camera coaxial video connector
- e. A minimum resolution of 380 Horizontal Television Lines (TVL), 350 Vertical TVL
- f. For Electromagnetic interference, ensure compliance with FCC Part 15, Subpart J, Class A device requirements, which apply to the video camera sensor and associated connected equipment in their installed condition
- g. Power the video camera sensors with 115 VAC +/-10%, 60 Hz nominal +/-3 Hz. Size the power conductors from the power source to the camera input so that no more than a 3% voltage drop is experienced (NEC 210-19 a., FPN No. 4). Include a provision at the rear of the camera enclosure for a waterproof connection of power and video signal cables over a single weather-tight MilSpec connector. Provide power from the cabinet power source through a surge suppressor and then to the video camera sensor.
- h. The Video camera sensor enclosure shall be installed in a light colored enclosure to limit solar heating. Meet NEMA 250 Type 4 enclosure standards for the enclosure and seal the enclosure to prevent sand, dirt, dust, salt and water from entering. Affix a sun shield visor to the front of the enclosure which is sufficiently adjustable to divert water away from the video camera sensor lens and also prevent direct sunlight from entering the iris when mounted in its installed location.

- i. Provide a single run of non-spliced outdoor-rated power and coaxial videocabling from the sensor enclosure to the cabinet in accordance with the manufacturer's recommendations. Interruptions in cable runs shall only be allowable for interfacing necessary surge protection devices. All connectors shall be professionally sealed to manufacturer recommendations.
- j. Environmental: -34° C to + 60° C (-29° F to 140° F) operating ambient temperature rated, in 0% - 100% relative humidity
- k. Shock and Vibration: Ensure that shock and vibration of the sensor adheres to NEMA TS2-2003 requirements.

## 2. Video Camera Sensor Type B

Furnish and install a thermal video camera sensor that is compatible with both freeway and arterial video applications, and compatible with the required detection processor type. Send a thermal video image from the thermal video camera sensor to the processor for real-time vehicle detection. Utilize thermal imaging to compensate for variations in lighting conditions, including blooming at night caused by headlights, rain and ice glare, and daytime cloud and sun position shadowing where a normal video camera sensor may not function as intended. Include a heater to prevent the formation of ice and condensation in cold weather. Ensure that the heater does not interfere with the operation of the video camera sensor electronics, or cause interference with the thermal video signal. As a minimum, meet the following requirements for each thermal video camera sensor assembly installation:

- a. Use a long-life, uncooled Vanadium Oxide (VOx) Microbolometer for the detector sensor, with a spectral range of 7.5 – 13.5 µm.
- b. The video standard should be compliant with NTSC Standard
- c. The video shall have a minimum NTSC array format of 320 x 240, with a 76,800 effective resolution
- d. For Electromagnetic interference, ensure compliance with FCC Part 15, Subpart B, Class B device requirements
- e. Power: Input voltage shall be 90 – 240 VAC single phase, with standard operating voltage at 110 VAC. Power consumption shall be 1.7 Watts nominal at 110 VAC with a maximum of 18 Watts.
- f. The thermal video camera sensor enclosure shall be installed in a light colored enclosure to limit solar heating and prolong equipment life
- g. Provide a single run of non-spliced outdoor-rated power and coaxial videocabling from the sensor enclosure to the cabinet in accordance with the manufacturer's recommendations. Interruptions in cable runs shall only be allowable for interfacing necessary surge protection devices. All connectors shall be professionally sealed to manufacturer recommendations.
- h. Environmental: -50° C to + 75° C (-58° F to 167° F) operating ambient temperature rated, in 0% - 95% relative humidity, with an IP66 rating.

## 3. Video Detection System Processor

### a. Freeway Cabinet Mounting

The IP addressable, MPEG4 encoded video detection system processor shall be either shelf or rack mountable in a standard 19-inch rack assembly space conforming to Standard CEA-310, 2005, latest version/addendum. If the video processor is shelf mounted, the Contractor shall provide the shelf and

the processor unit housing for each processor type. If the video detection system requires a 19" rack with powered backplane, the contractor shall provide the 19" rack and attach all power and communications cables according to manufacturer specifications. The video detection system processor shall be designed for mounting in an enclosed cabinet and/or Hub building without blower fans and mounting without insulation from other electronic devices such as power supplies, communications equipment, etc. The video detection system shall meet NEMA TS-2 temperature requirements.

Power the video detection system processor by 120 VAC, 60 Hz, single phase. If a transformer is required for a 12 or 24 VDC power requirement, the Contractor shall supply the transformer and/or enclosure and size it appropriately for the installation. Size power conductors from the power source for the video detection system processor input so that no more than a 3% voltage drop is experienced (NEC 210-19 a., FPN No. 4). The video detection system processor shall have transient protection that meets the requirements of NEMA TS1-1989 (R1994, R2000, R2005) and NEMA TS2-2003 standards.

- Video Detection System Processor, Type A

Provide one (1) video inputs on the video detection system processor such that signals from one video camera sensor or other synchronous or non-synchronous video source can be processed in real time. Use BNC connectors on the processor for all video inputs. Use a BNC connector or RCA connector on the front or back of the video detection system processor for video output.

- Video Detection System Processor, Type B

Provide at least two (2) video inputs on the video detection system processor such that signals from up to two (2) video camera sensors or other synchronous or non-synchronous video sources can be processed in real time in one cabinet. Use BNC connectors on the back of the video detection system processor for all video inputs. Use a BNC connector on the front or back of the video detection system processor for video output.

- Video Detection System Processor, Type C

Provide at least four (4) video inputs on the video detection system processor such that signals from up to four (4) video camera sensors or other synchronous or non-synchronous video sources can be processed in real time in one cabinet. Use BNC connectors on the back of the video detection system processor for all video inputs. Use a BNC connector on the front or back of the video detection system processor for video output.

b. Signal or Ramp Meter Cabinet Mounting

Provide an IP addressable processor module, which performs video image processing and MPEG4 encoding, that completely fits within the loop detector slots of the traffic signal or ramp meter controller cabinet input file and that provides a standard relay closure detector input to the controller. Provide from one to four detector outputs through the processor module which communicate through the edge card connector. Use a module that is not wider than two standard input file slots. Include detection indicators on the front panel of the processor module for each channel of detection provided through that module to indicate detector output in real time when the system is operational. Include a BNC connector with gold plated center pin or RCA connector on the front panel for video output to a Monitoring device, and include a RJ-45 Ethernet port connector on the front panel to connect and communicate the Programming Device.

Provide power to the processor modules through the signal or ramp cabinet detector input file, or the Output Expansion Module.

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- Video Detection System Processor, Type D  
Provide one (1) video inputs on the video detection system processor such that signals from one video camera sensor or other synchronous or non-synchronous video source can be processed in real time. Use BNC connectors on the processor for all video inputs. Use a BNC connector or RCA connector on the front or back of the video detection system processor for video output.
- Video Detection System Processor, Type E  
Provide at least two (2) video inputs on the video detection system processor such that signals from up to two (2) video camera sensors or other synchronous or non-synchronous video sources can be processed in real time in one cabinet input file. Use BNC connectors on the back of the video detection system processor for all video inputs. Use a BNC connector on the front or back of the video detection system processor for video output.
- Video Detection System Processor, Type F  
Provide at least four (4) video inputs on the video detection system processor such that signals from up to four (4) video camera sensors or other synchronous or non-synchronous video sources can be processed in real time in one cabinet input file. Use BNC connectors on the back of the video detection system processor for all video inputs. Use a BNC connector on the front or back of the video detection system processor for video output.
- Environmental Requirements (All Types)  
Provide a video detection system processor that operates reliably in a typical roadside traffic cabinet environment. Provide internal cabinet equipment and a video detection system processor that meet the environmental requirements of NEMA TS1-1989 (R1994, R2000, R2005) and NEMA TS2 standards.  
  
Operating ambient temperature range: -29°F to 165°F (-34°C to 74°C). Additionally, include a heater to prevent the formation of ice and condensation in cold weather. Do not allow the heater to interfere with the operation of the video camera sensor electronics, or cause interference with the video signal.  
  
Humidity range: 5-95% humidity per NEMA TS1-1989 (R1994, R2000, R2005), Section 2.1.5.2.

#### **B. Functional Requirements for Video Detection Systems(all Types)**

This section defines the minimally required functional aspects of the system as well as the required accuracy levels. It also outlines the testing process that will be used to determine whether a proposed video detection system product meets these specifications.

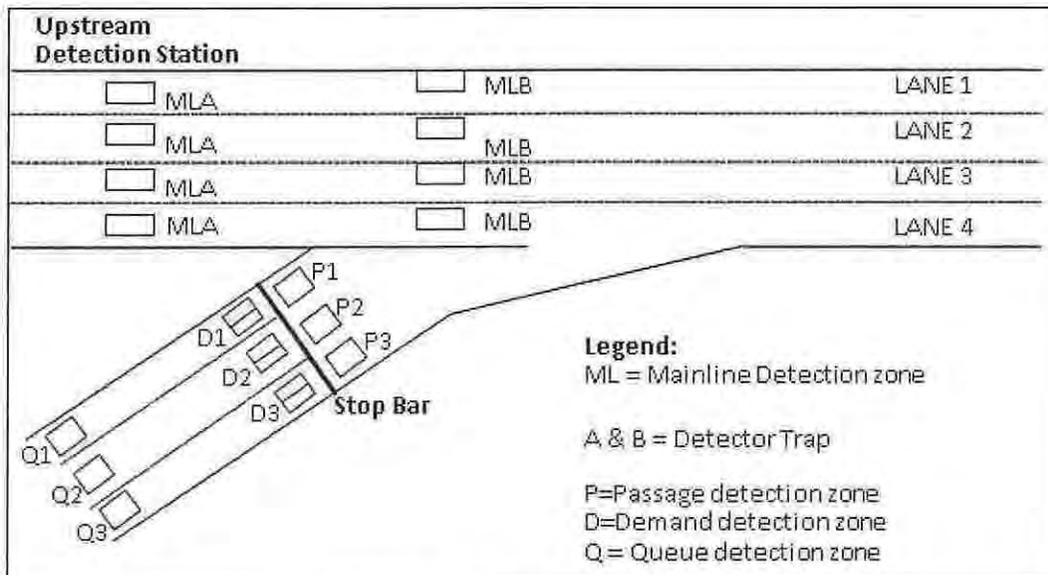
1. Ensure that Video Detection Systems provides vehicle presence, speeds, vehicle counts and roadway occupancies on a lane-by-lane basis. Verify that the system can, at a minimum, emulate the output of a pair of 6 ft. by 6 ft. in-pavement loops spaced 16 ft. apart. Ensure that the Video Detection Processor is capable of providing a minimum 24 detection zones with one video camera sensor. Verify that the system responds with the accumulated traffic data as collected since the last request.
2. Verify that the detection system is IP-addressable and that all communication addresses are user programmable. Ensure the setup program assigns an IP address to the detection processor. Ensure that configuration to the system are either in serial format using an Electronic Industries Alliance (EIA) standard

EIE-232 communication or an Internet Protocol (IP) interface as approved by GDOT's Information Technology group.

3. Verify that the traffic data collected by the Video Detection System, and the system configuration is stored within internal non-volatile memory within the video detection system processor. Perform software updates through an Ethernet, serial, or USB port. Verify that data can be retrieved from the system either locally or via requests from computers at the central Transportation Management Center (TMC) over the communications network.
  4. Ensure the video detection system processor front panel includes a visual display of the status of each video input. Indicators shall display, at a minimum, the status of video detection system processor communications, the status of the video detection system processor, the status of communications, and whether or not each video camera sensor is actively detecting. The Video Processor shall allow a remote user with a standard web browser to gain remote access, collect data, control, and configure the VDS.
  5. Ensure the Video Detection System includes computer software, which enables the user to program, calibrate, operate and view current status of all system features using a laptop computer, or network-connected workstation at the central TMC. Ensure the system allows the user to view live MPEG4 video from the image sensor with the programmed detectors overlaying the image. Ensure individual vehicle actuations can be viewed while observing the live MPEG4 encoded video.
  6. Ensure the Video Detection System configuration data can be uploaded and saved to a laptop or TMC workstation computer for later re-loading to the video detection processor if necessary.
  7. Ensure that the system offers an open Application Programming Interface (API) and software development kit (SDK) for GDOT developers and their consultants to integrate the Video Detection System with Central Software or other third-party software and systems. Furnish needed software licenses for the system.
  8. Ensure the system user can use a laptop to reprogram, calibrate, adjust or alter any previously defined detector configurations in the field and also reprogram any detector configurations over the network or from a TMC workstation.
  9. Provide software that can communicate concurrently between multiple users and multiple video detection processors on the same network without any interruption or conflict with the normal polling cycle.
- C. Additional Functional Requirements for Signal and Ramp Meter Video Detection Systems (Type D, E, F)**
1. System Hardware: Provide a detection system that does not require any equipment external to the traffic signal/ramp meter controller cabinet input file (excluding the video camera sensor, video camera sensor power connection, circuit breakers and surge protection for video or data). Mount the processor and expansion modules in the traffic signal/ramp meter controller cabinet input files, using the edge card connector to obtain power and provide contact closure outputs. Rewiring of the backplane or any other cabinet panel for the system is not permitted except for power and grounding for the interface panel, wiring from the video camera sensor to the loop detector panel for the video signal and wiring to obtain power for the video camera sensor.
  2. Provide a system capable of providing a minimum of eight detector outputs per video camera sensor. Provide all detector outputs through edge card connectors of the processor module and output expansion module(s). Rewiring external to the edge connectors is not permitted for obtaining a minimum of eight outputs for one video camera sensor.

3. System Software System Processing Software: On the processor module that mounts in the traffic signal/ramp meter controller cabinet input file, include the software that processes the video camera sensor signals and converts the signals into detector outputs. Detect either approaching or receding vehicles in multiple lanes within the field of view (FOV) of each video camera sensor. Provide the capability of detecting vehicles in up to 24 detection zones per video camera sensor with the detection system. Allow the detection zones to be combined to form one output.
4. Detection Compensation: Provide the capability for the processor to compensate for camera movement attributable to temperature effects, wind shifting, pole sway, pole expansion, or vibration.
5. System Configuration Software: On the processor module, include the configuration software to program the detection system, including the detection zones.
6. On a monitoring device, display the detection zones superimposed on the video camera sensor's images. Provide the capability to create detection zones of varying size and shape to allow best coverage of the viewable roadway lanes and ramps. Provide the capability to save the detection zone format on the processor module card once drawn for a particular video camera sensor image. Provide the capability for the user to view the currently active detector zone format of the MPEG4 encoded processor module via a monitoring device.
  - a. Confirmation: When viewing vehicle actuations in real time on the monitoring device, indicate the passage or presence of each vehicle detected by each detection zone by changing the color or intensity of that particular zone.
  - b. Detection During Reconfiguration: Provide the capability for the detection system to continue detecting vehicles on all existing zones during reconfiguration, except on the zone that is being reconfigured.
  - c. I-VDSn designation: I-VDSn refers to all of the specific VDS components necessary for operation and detection on one approach leg of an intersection. The "n" denotes the approach's through-movement controller phase in the nomenclature of a typical 8-phase dual-ring intersection operation (e.g., I-VDS2, I-VDS4, I-VDS6, I-VDS8) when four video camera sensors are installed. If more than four video camera sensors are installed, the "n" denotes the controller phase being detected in the nomenclature of a typical 8-phase dual ring intersection operation. I-VDSn is also used as a prefix to identify the individual VDS components of the "n" approach as follows:
    - I-VDSnVCS: the video camera sensor for approach "n"
    - I-VDSnCC: the coaxial cable from the video camera to the controller cabinet for approach "n"
    - I-VDSnPC: the video camera sensor power cable from the video camera to the controller cabinet for approach "n"
    - I-VDSnCSS: the coaxial cable surge suppressor in the controller cabinet for approach "n"
    - I-VDSnCJ: the coaxial jumper cable from the coaxial surge suppressor in the controller cabinet to the processor module or detector panel for approach "n"
    - I-VDSnPM: the processor module for approach "n", where a Processor Module, Type A is installed
    - I-VDSpn/snPM: the processor module for approach "pn" and "sn", where "pn" is the primary approach and "sn" is the secondary approach, where a Processor Module, Type B is installed.
    - Occupancy: individual lane occupancy measured in percent of time

- d. Ramp Meter Controller Cabinet Input File: A Ramp Meter Controller Cabinet Input File is a chassis within a traffic signal cabinet rack that has slots where a detector card provides detector output to the traffic signal controller through its edge card connectors. The backplane connector pin output of the edge connectors conforms to Georgia traffic signal controller cabinet standards for the cabinet type specified in the plans.
- e. I-VDSnnn: I-VDSnnn refers to all of the specific VDS components necessary for operation and detection related to ramp metering installations based on direction, type of detection and lane assignments. The first "n" denotes the approach direction (north, south, east or west) and the second "n" denotes the type of detection, P=Passage Detection Zones, D=Demand Detection Zones, Q=Queuing Detection Zones, ML=Mainline Detection Zones, the third "n" denotes the lane assignment (lane 1=L01, lane 2=L02, lane 3=L03, lane 4=L04), the (e.g., I-VDSnPL01, I-VDSsDL02, I-VDSeQL03, I-VDSwMLL04). The typical ramp metering layout is shown below:



**Figure 1: Typical Ramp Meter Layout**

Lane numbering shall begin at the median for mainline travel lanes. Lane numbering for ramp meter lanes shall begin with the lane adjacent to the mainline travel lanes,

I-VDS is also used as a prefix to identify the individual I-VDS components used for signal and freeway ramp metering as follows:

- I-VDSnnnVCS: the video camera sensor for "nnn" direction, type of detection and lane assignment
- I-VDSnnnCC: the coaxial cable from the video camera to the controller cabinet for approach "nnn" direction, type of detection and lane assignment
- I-VDSnnnPC: the video camera sensor power cable from the video camera to the controller cabinet for approach "nnn" direction, type of detection and lane assignment
- I-VDSnnnCSS: the coaxial cable surge suppressor in the controller cabinet for approach "nnn" direction, type of detection and lane assignment

- I-VDSnnnCJ: the coaxial jumper cable from the coaxial surge suppressor in the controller cabinet to the processor module or detector panel for approach "nnn" direction, type of detection and lane assignment
- I-VDSnnnPM: the processor module for approach "nnn" direction , type of detection and lane assignment

#### D. Accuracy Requirements for Video Detection Systems

Provide a Video Detection System that meets the below minimum accuracy requirements for both daytime and night time conditions:

1. For volume (vehicle counts): 95% (no more than 5% missed actuations).
2. For speed measurement: 95% (no more than 5% error in speed calculation)
3. For occupancy measurement: 95% (no more than +/- 5% missed actuations)
4. For presence detection: 95% (no more than +/- 5% error in missed actuations)

#### E. Testing

Vendors are required to submit an independent test evaluation report from a third party which verifies the accuracies stated within their specifications.

Develop and submit plans for pre-installation and post-installation testing to the Engineer for consideration and approval. Ensure the plans test all functional requirements outlined in Section 937.2.01, and the accuracy requirements stipulated in Section 937.2.01D. Provide the Engineer with Application Protocol Interface (API) documentation and Software Development Kit (SDK) for the video detection system, as requested by the Department. GDOT will have 30 days from receipt of the API and SDK to make a determination if it can be integrated. If the device cannot be integrated, the Engineer will give notice that the Contractor must submit a device that can be integrated into the central system software.

##### 1. Pre-installation test requirements

Should the device not be on the QPL, include at a minimum the following procedures in the test plan to demonstrate the Video Detection System provides all the functional requirements in Section 937.2.01 B and C and meets the accuracy requirement stipulated in Section 937.2.01D. Installation of detection systems will not begin until the pre-installation test requirements have been successfully completed, as outlined.

- a. Install a test video detection system at a location determined by GDOT. Install a new video sensor for the test. Install a test video detection system that includes all components of the system including a video sensor, a video detection processor and software.
- b. Connect the Video Detection System processor to the GDOT communications network via a GDOT-provided field switch. Assign an IP address to the processor per GDOT's direction.
- c. From the nearest Hub building, configure the Video Detection System processor to gather the data according to the requirements as specified in Section 937.2.01. Verify that the configuration data is stored in non-volatile memory.
- d. Demonstrate that each required data element is gathered by the system at the user-specified interval. Use 20-seconds as the interval for demonstration testing. Prove the accuracy of the detection system meets requirements in Section 937.2.01D by:

- Driving a vehicle of known speed and length through the detection zone and observing and recording the speed and length calculated by the system. Repeat this measurement at least ten times.
- Record fifteen minutes of traffic video from the image sensor at the same time the detection system is collecting data. Manually count the recorded traffic video and verify the count data calculated by the detection system meets the required accuracy requirements.
- Perform the above accuracy tests in both night and day conditions.
- Upon GDOT acceptance of pre-installation test results, begin the installation of VDS as specified in the plans.
- If any part of the pre-installation test fails, the contractor has up to two subsequent attempts to correct the problem to the satisfaction of the Engineer. All these subsequent tests must be completed within a two week period from the date of initial failure.

## 2. Post-installation test procedures

Utilize the following test procedures after the video detection system has been installed in its entirety as shown on the Plans. Commence no post-installation testing until all video detection systems in the project have been configured and/or calibrated to gather speed, volume, occupancy and/or presence detection, and programmed to communicate on the GDOT network. Including the accuracy testing requirements, at a minimum, provide the following on the test plan to be submitted and approved by the Engineer:

- a. Inspect all vehicle detection system field components to ensure proper installation and cable termination.
- b. Verify that field construction has been completed as specified in the plans.
- c. Inspect the quality and tightness of ground and surge protector connections.
- d. Check power supply voltage and outputs and ensure device connections are as specified in the Plans.
- e. Verify that the installation of cables and connections between all detectors and field cabinets are as specified in the Plans
- f. Demonstrate that each Video Detection System is fully operational and gathering the required data types at the specified interval. Perform this test from the hub building through which the detection system is connected.
- g. Upon satisfactory completion of step f, GDOT will add the new video detection system(s) into the central system

### 937.2.02 Microwave Vehicle Detection System (MVDS)

#### A. Requirements

##### 1. Microwave Detector

- a. Provide a microwave detection system that meets the following minimum requirements:

Microwave Transmission: The microwave radar detector shall transmit on a frequency band of 24 (twenty-four) GHz  $\pm$ 25 MHz or another approved spectral band. It shall comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules or the appropriate Spectrum Management Authority. The Microwave Unit shall not interfere with any known equipment.

b. Area of Coverage

The Microwave Unit's field of view shall cover an area defined by an oval shaped beam and its maximum detection range shall be as follows:

- Elevation Beam Width                      50 degrees or more
- Azimuth Beam Width                        12 degrees or less
- Range    6 to 250 feet

c. Detection Zones

The minimum number of detection zones defined shall be no less than ten (10).

d. Capabilities

The Microwave Unit shall be a true presence detector. It shall be suitable for mounting on roadside poles or on overhead structures, at a mounting height determined by the manufacturer, to provide the following:

- Presence indication of moving or stopped vehicles in its detection zones.
- Traffic data, periodically accumulated over user defined time intervals in a 10 to 600 sec range, shall be transmitted via serial RS-485 communications lines to a serial port on the terminal server, provided by the Contractor and as specified in Specification 939.
- Traffic data shall be available simultaneously with detection zone contact closures and serial communications. Supply all modules as necessary for simultaneous communications.
- Side-fired configuration data shall include the following in each of up to Ten (10) detection zones (lanes):
  - Volume
  - Lane occupancy
  - Average speed

Vehicle classification by length in a minimum of 3 user defined classes.

- Microwave Unit's in forward-looking configuration shall monitor traffic in one lane and be capable of providing the following data:
  - Volume, occupancy, average speed and travel direction in the lane
  - Per vehicle speed and direction
  - Binning of Volume data in up to 7 speed bins
- MVDS shall allow the user to define the contents of transmitted data.
- Furnish the unit with the required software for data collection, processing, configuration and set-up, and data logging and retrieval. An operator shall be able to use the software to set detector count periods, sensitivities, and other operational features and parameters. The software must be capable of providing both manual and automatic setup and calibration.

e. Environmental Conditions and Protection

Except as stated otherwise herein, the equipment shall meet all its specified requirements during and after  
subjecting to any combination of the following:

- Ambient temperature range of -40° to +74° C
- Relative humidity from 5 to 95 percent, non-condensing
- Power surge of ± 1kV (rise time = 1.2 µsec, hold = 50µsec) applied in differential mode to all lines, power and output, as defined by IEC 1000-4-5 and EN 61000-4-5 standards or 300v TS2
- The microwave radar detector shall be resistant to vibration in accordance with IEC 68-2-30 (test Fc), NEMA TS-1 (Section 2.1.12), or approved equivalent
- The microwave detector shall be resistant to shock in accordance with IEC 68-2-27 (test a), NEMA TS-1 (Section 2.1.13), or approved equivalent

f. Mechanical

The microwave radar detector shall be enclosed in a rugged weatherproof box and sealed to protect the unit from wind up to 90 mph, dust and airborne particles, and exposure to moisture (NEMA Type 3R or 4x enclosure).

The mounting assembly shall have all coated steel, stainless steel, or aluminium construction, and shall support a load of 20 pounds. The mounting assembly shall incorporate an approved mechanism that can be tilted in both axes and then locked into place, to provide the optimum area of coverage.

g. Electrical

The MVDS unit shall be operable from 12 - 24 VDC. Power supply shall be obtained from the MVDS communications wiring module in the device cabinet. Alternative power sources and adapters shall be submitted and approved by the Engineer.

The MVDS unit shall include Power Management features, allowing remote shutdown or cyclical shutdown of the unit.

h. Cables

Connection between the MVDS and the cabinet equipment shall be provided by a single MVDS unit harness cable that is MS-connector terminated at the MVDS detector and terminated to the MVDS communications wiring module in the equipment cabinets. No splices are permitted in the cable. The cable shall at a minimum provide power and the RS-485 serial data interface to the MVDS unit.

The MS connector pins must be crimped to the cable conductors and assembled and tested by the manufacturer prior to installation and pulling of cable on site. RS-485 signal ground shall be provided by the shield drain wire, an additional conductor, or an additional shielded pair, in accordance with the MVDS unit manufacturer's recommendations. Twisted pairs shall be identified by separate insulation colours. Communications pairs shall be individually or commonly shielded. Low voltage power conductors shall not be shielded in common with the communications pairs.

i. Electrical Isolation and Surge Protection

All power lines, contact closures and the serial port shall be surge protected within the unit. Contact closures and the serial port shall be isolated. Ensure that the surge protection of all cables and connections meets the minimum requirements of Section 925.2.02 A, part 14, Surge Protection.

j. Data Interface

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Data communications shall be full duplex asynchronous, configurable as:

- Opto-isolated RS-485 port at rates from 9600 up to 115200 bits per second.
- Separate, local control RS232 serial port
- Serial data format shall be standard binary NRZ 8 bits data, 1 stop bit, No parity.
- Both point-to-point and multi-dropped configurations shall be supported.

#### **B. Functional Requirements for Microwave Detection Systems**

This section defines the minimally required functional aspects of the microwave detection system as well as the required accuracy levels. It also outlines the testing process that will be used to determine whether a proposed microwave detection system product meets these specifications.

1. Ensure that Microwave Detection Systems proposed for use provides vehicle presence, classification, speeds, vehicle counts and roadway occupancies on a lane-by-lane basis at a user definable reporting period between 20 to 600 seconds, and can detect a minimum of 10 detection zones where the farthest lane at ideal mounting height can detect at a maximum distance of 250 feet.
2. Verify that the traffic data collected by the Microwave Detection System is stored within internal non-volatile memory. Verify that data can be retrieved from the system either locally or via requests from computers at the central Transportation Management Center (TMC) over the communications network. Verify that the system configuration data and system software is also stored within internal non-volatile memory.
3. Ensure the Microwave Detection System includes computer software for the user to program, calibrate, operate and view current status of all system features using a laptop computer or network-connected workstation at the central TMC. Ensure the system allows the user to view live actuations from the microwave detector with the programmed detectors overlaying a representation of the roadway.
4. Ensure the Microwave Detection System configuration data can be uploaded and saved to a laptop or TMC workstation computer for later re-loading to the video detection processor if necessary. Ensure the system user can use a laptop or TMC workstation to reprogram, calibrate, adjust or alter any previously defined detector configurations. Ensure no periodic adjustments or fine-tuning is required except in the case of physical roadway changes such as lane-shifts, new construction or closures.
5. Ensure that the system offers an open Application Programming Interface (API) and software development kit (SDK) for GDOT developers and their consultants to integrate the Microwave Detection System with GDOT Central Software or other third-party software and systems. Furnish needed software licenses for the system.

#### **C. Accuracy Requirements for Microwave Detection Systems**

Provide a Microwave Detection System that meets the below minimum accuracy requirements for all conditions. Accuracy measurements for the testing shall be done with an appropriate sample size of vehicles, over a specific time period. Submit to the Engineer the Test plan for accuracy testing at the location that is site specific to the plans. The test plan shall take into account the roadway type (freeway, arterial), location (urban, rural), and traffic conditions in order to determine appropriate testing length and sample size. The following conditions shall be met for each sensor installed:

##### **Measurement Accuracy**

The following error levels shall be achievable and demonstrated during testing.

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Parameter	Error Percentage
Presence	±5%
Volume	±8%
Lane Occupancy	±10%
Average Speed	±10%
Length Classification limits	±10%
Time event	10ms
Input Voltage	±2%

**D. Testing**

Develop and submit plans for pre-installation and post-installation testing to the Engineer for consideration and approval. Ensure the plans test all functional requirements outlined in Section 937.2.02B and the accuracy requirements stipulated in Section 937.2.02C. Provide the Engineer with Application Protocol Interface (API) documentation and Software Development Kit (SDK) for the microwave detection system. GDOT will have 30 days from receipt of the API and SDK to make a determination if it can be integrated. If the device cannot be integrated, the Engineer will give notice that the Contractor must submit a device that can be integrated into the central system software.

1. Pre-installation test requirements

**Should the device not be on the QPL, include at a minimum the following procedures in the test plan to demonstrate the Microwave Detection System provides all the functional requirements in Section 937.2.02B and meets the accuracy requirement stipulated in Section 937.2.02C. Installation of detection systems will not begin until the pre-installation test requirements have been successfully completed.**

- a. Install a test microwave detection system at a location determined by GDOT. Install a new microwave detector for the test. Install a test detection system that includes all components of the system including a microwave detector, microwave detector processor and software.
- b. Connect the Microwave Detection System processor to the GDOT communications network via a GDOT-provided field switch. Assign an IP address to the processor per GDOT's direction.
- c. From the nearest hub building, configure the Microwave Detection System processor to gather the data required in Section 937.2.02B. Verify that the configuration data is stored in non-volatile memory. Initial configuration of the detection system shall be done with a programming device that is either a keyboard/keypad or stationary track ball pointing devices. Connect the programming device to the front of the processor module through a USB, DB9 or PS/2 connector. Provide a programming device that is PC compatible.
- d. Demonstrate each required data element is gathered by the system at the user-specified interval. Use 20-seconds as the interval for this phase of testing.
- e. Prove the accuracy of the detection system meets requirements in Section 937.2.02C by:
  - Driving a vehicle of known speed through the detection zone and observing and recording the speed calculated by the system. Repeat this measurement at least five times.

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- Perform the above accuracy tests in both rainy and dry conditions.
- Upon GDOT acceptance of pre installation test results, begin the installation of microwave detection system as specified in the plans.
- If any part of the pre installation test fails, the contractor has up to two subsequent attempts to correct the problem to the satisfaction of the Engineer. All these subsequent tests must be completed within a two week period from the date of initial failure.

## 2. Post-installation test procedures

Utilize the following test procedures after the microwave detection system has been installed in its entirety as shown on the Plans. Commence no post-installation testing until all microwave detection systems in the project have been configured and/or calibrated to gather speed, volume, classification, and occupancy and programmed to communicate on the GDOT network. Including the accuracy testing requirement, at a minimum, provide the following on the test plan to be submitted and approved by the Engineer.

- a. Inspect all microwave detection system field components to ensure proper installation and cable termination.
- b. Verify that field construction has been completed as specified in the plans.
- c. Inspect the quality and tightness of ground and surge protector connections.
- d. Check power supply voltage and outputs and ensure device connections are as specified in the Plans.
- e. Verify that the installation of cables and connections between all detectors and field cabinets are as specified in the Plans and in accordance with the manufacturers' recommendations.
- f. Demonstrate that each Microwave Detection System is fully operational and gathering the required data types at the specified interval. Perform this test from the hub building through which the detection system is connected.
- g. Upon satisfactory completion of step f, GDOT will add the new microwave detection system(s) into the central system

### 937.2.03 Wireless Magnetometer Vehicle Detector System (WMVD)

This specification sets forth the minimum requirements for a system to detect vehicles on a roadway by using battery-powered magnetometer-type sensors that communicate their detection data by radio to a roadside communications hub before the data is relayed to a freeway cabinet, a local traffic controller cabinet, a central software system, and/or a data server as required by the application. The application of the WMVDS and equipment specified shall be as shown in the plans. These specifications cover both intersection presence based vehicle detection used for traffic controller input, as well as freeway system or advanced system detection data collection of volume, occupancy and speed.

#### A. Requirements

The detection system shall provide accurate roadway information as needed to support the traffic management application.

1. The Wireless Battery-Powered Magnetometer Vehicle Detection System shall consist of one or more of the following:
  - a. Battery-powered wireless sensors installed in-pavement in each traffic lane w/ reuse enclosure.

- b. Serial Port Protocol (SPP) Digital Radios mounted on the side of the roadway w/ cable and mount.
  - c. Wireless battery-powered Repeaters (RPs) mounted on the side of the roadway, serving to extend the radio range of an SPP w/ mount.
  - d. Access Point Contact Closure Interface (APCC) cards to provide sensor information processing and support the interface between an SPP and a standard traffic controller using contact closure signals, or mounted in a stand alone cabinet w/ direct IP communications.
  - e. Extension (EX) contact closure cards to provide additional detector outputs to a traffic controller
  - f. Isolation (ISO) Modules to provide surge protection and isolation, as well as providing signal conditioning to enhance the communication distance from the SPP and the APCC.
  - g. Input/Output (I/O) Modules used to provide additional communication options, memory options and a battery backed real time clock.
  - h. Software to control and configure the sensors, APCC, SPP's and RPs.
  - i. Communications between a sensor and SPP can be direct, via a single repeater, or via two repeaters operating in tandem. Communications between the sensors and the SPP or RP and between the RP and SPP or another RP shall be via radio.
  - j. Detection data shall be capable of being relayed from each AP to a local traffic controller for real-time vehicle detection using contact closure signals. Data shall also be capable of being relayed directly from each AP to a central software system or central server over standard IP (Internet Protocol) networks.
2. WMVD Sensor Type
- a. All sensor components shall be contained within a single housing.
    - The sensor housing shall conform to NEMA Type 6P and IEC IP68 standards.
    - The sensor components shall be fully encapsulated within the housing to prevent moisture from degrading the components.
  - b. A sensor shall operate at temperatures from -37 °F / -38.3 °C to +176 °F / +80 °C.
  - c. A sensor shall be battery-powered with an average lifetime of ten (10) years when the sensor is configured for and operating under normal traffic conditions.
  - d. Two configurations of sensors shall be available from the manufacturer:
    - Type A: shall provide all sensor functions, including data collection functions
    - Type B: shall support presence detection only
    - The drawings and/or plans shall dictate the sensor type required.
3. Serial Port Protocol (SPP) Device
- a. An SPP shall support at least 48 sensors with a 0.125 second latency.
  - b. An SPP shall operate at temperatures from -37 °F / -38.3 °C to +176 °F / +80 °C.
  - c. All SPP components shall be contained within a single housing.
    - The SPP housing shall conform to NEMA Type 4X and IEC IP67 standards.

- d. The SPP shall communicate to the APCC utilizing a standard CAT5e or higher Ethernet cable.
  - e. The SPP shall have a weatherproof Ethernet connector on the bottom.
  - f. The Ethernet connector shall be shipped with a cover firmly attached to provide protection from the elements prior to cable connection.
    - The weatherproof connector shall not require any specialized tools for installation.
4. WMVD Repeater (RP)
- a. An RP communicating directly to an AP shall support at least 10 sensors.
  - b. An RP communicating to an AP via an intermediate RP (i.e., tandem operation) shall support at least 6 sensors.
  - c. An RP shall be battery-powered and battery shall last for a minimum of seven years when operating in normal traffic conditions.
  - d. The RP battery shall be field replaceable.
  - e. An RP shall operate at temperatures from -37 °F / -38.3 °C to +176 °F / +80 °C.
  - f. All RP components shall be contained within a single housing.
    - The RP housing shall conform to NEMA Type 4X and IEC IP67 standards.
5. WMVD Access Point Contact Closure (APCC) Card Type
- a. Each APCC card shall be capable of communicating with at least 2 SPP modules.
  - b. Optional Extension (EX) cards shall provide additional contact closures in a signal cabinet (user configurable from 1 to 4 outputs each).
  - c. The APCC shall provide all the higher level processing and interface functions of the system.
  - d. Each APCC card shall provide detector data as contact closure signals to the traffic controller.
    - Type A: An APCC card shall directly plug in to standard 170/2070 input files.
    - Type B: An APCC card shall be supplied within a standard enclosure to supply power for use in freeway applications.
  - e. The APCC and EX cards front panel shall be either software or via front panel switches configurable to provide:
    - Presence or pulse mode
    - Delay timing
    - Extension timing
  - f. An APCC and EX card shall operate at temperatures from -37 °F / -38.3 °C to +176 °F / +80 °C.
  - g. An APCC and EX card shall operate in humidity up to 95% (non-condensing).
6. Isolator module
- a. An Isolator module shall be used between each SPP and APCC to extend communications range and protect the APCC card from transient surges.

- b. The isolator module shall extend the communication range between the APCC and SPP from 33 feet (10 m) to 2000 feet (600 m).
- c. The isolator module shall provide electrical isolation of 1500V.
- d. The isolator module shall provide surge protection of up to 1500V.
- e. The isolator module shall provide AC power cross protection.

7. Input/Output (I/O) Module Type

An I/O module shall expand the capabilities of an APCC by adding a SD Memory Card Slot and battery backed up real time clock. The module shall be of the following types.

- a. Type A: RS232 port for serial communications
- b. Type B: Detection data shall be communicated as IP data over GSM-based cellular data services via a GPRS cellular modem.
- c. Type C: Detection data shall be communicated as IP data over CDMA-based cellular data services via a 1xRTT cellular modem.

The I/O module shall be physically mounted to the APCC and shall be the same width. The combined APCC with I/O module shall be the width of a standard 2 slot wide detector amplifier.

**B. Functional Requirements for Wireless Magnetometer Vehicle Detection**

1. Sensors

Each sensor shall detect a vehicle by measuring changes in the earth's magnetic field near the sensor as caused by a stopped or passing vehicle (i.e., magnetometer-type detection)

- a. The sensor shall communicate time-stamped ON and OFF vehicle detection events
- b. Each sensor shall automatically recalibrate in the event of a detector lock
- c. Each sensor shall communicate by radio to a nearby SPP or RP
- d. Each sensor shall automatically re-transmit a detected event if no acknowledgement is received from the AP
- e. Each sensor shall respond within 100 seconds when the AP is powered on and transmitting

2. The radio links between each sensor and SPP or RP and between each RP and SPP or each RP and RP shall conform to the following:

- a. The center frequencies, bandwidths, and transmit power levels of the radio links shall allow operation in an unlicensed frequency band
- b. Frequency channels shall be employed by the sensors, APs, and RPs to avoid interference with other devices operating in the unlicensed band
- c. Frequency channels shall be user-configurable
- d. At least 16 frequency channels shall be supported

3. If detection data is relayed to a central software system or central server, each installation of the Wireless Battery-Powered Magnetometer Vehicle Detection System shall provide the following measurements, as required by the application:

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- a. Vehicle volume (count) per lane over a specified time interval
  - b. Lane occupancy (percent) over a specified time interval
  - c. Vehicle speed (mph or kph) when more than one sensor is deployed in a lane
  - d. Per-vehicle speed
  - e. Median speed over a specified time interval
  - f. Mean speed over a specified time interval
  - g. Distribution of speeds over a specified time interval
  - h. Vehicle classification when more than one sensor is deployed in a lane
  - i. Per-vehicle length
  - j. Report distribution of vehicle lengths over a specified time interval
  - k. The time interval for measurements shall be selectable from 30 seconds to 24 hours
4. Each sensor in an installation shall be capable of being individually configured with its own sensitivity level.
- a. A single sensor shall be capable of being configured with a sensitivity level that approximates the detection zone of a standard 6' x 6' / 1.8m x 1.8m inductive loop
  - b. Each sensor shall be capable of being configured with relatively higher or lower sensitivity levels as may be required to detect bicycles, motorcycles, or light rail
  - c. An APCC shall support the relay of sensor detection data through several interfaces as required by the application. The APCC shall be capable of simultaneously communicating detection data via the contact closure interface, Ethernet interface, and cellular data modem interface, as applicable.

**C. Accuracy Requirements for the Wireless Magnetometer Vehicle Detection System**

Provide a WMVD system that meets the below minimum accuracy requirements for all conditions. Accuracy measurements for the testing shall be done with an appropriate sample size of vehicles, over a specific time period. Submit to the Engineer the Test plan for accuracy testing at the location that is site specific to the plans. The test plan shall take into account the roadway type (freeway, arterial), location (urban, rural), and traffic conditions in order to determine appropriate testing length and sample size. The following conditions shall be met for each sensor installed:

**Measurement Accuracy**

The following error levels shall be achievable and demonstrated during testing.

Parameter	Error Percentage
Presence	±5%
Volume	±8%
Lane Occupancy	±10%
Average Speed	±10%
Length Classification limits	±10%

**D. Testing**

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Develop and submit plans for post-installation testing to the Engineer for consideration and approval. Ensure the plans test all functional requirements outlined in Section 937.2.03B and the accuracy requirements stipulated in Section 937.2.03C. Provide the Engineer with Application Protocol Interface (API) documentation and Software Development Kit (SDK) for the WVDS detection system. GDOT will have 30 days from receipt of the API and SDK to make a determination if it can be integrated. If the device cannot be integrated, the Engineer will give notice that the Contractor must submit a device that can be integrated into the central system software. The testing shall prove that all in-pavement sensors are configured and collecting data as required in this specification and as shown on the plans.

1. Pre-installation test requirements: Should the device not be on the QPL, include at a minimum the following procedures in the test plan to demonstrate the Wireless Magnetometer Detection System provides all the functional requirements in Section 937.2.03B and meets the accuracy requirement stipulated in Section 937.2.03C. Installation of detection systems will not begin until the pre-installation test requirements have been successfully completed.
  - a. Install a test WVDS at a location determined by GDOT. Install a new sensor, repeater and APCC for the test. Install a test detection system that includes all other components of the system.
  - b. Connect the APCC processor to the GDOT communications network via a GDOT-provided field switch. Assign an IP address to the APCC per GDOT's direction.
  - c. From the nearest hub building, configure the APCC to gather the data required in Section 937.2.03B. Verify that the configuration data is stored in non-volatile memory. Initial configuration of the detection system shall be done with a programming device, as determined by the manufacturer.
  - d. Demonstrate each required data element is gathered by the system at the user-specified interval. Use 20-seconds as the interval for this phase of testing, unless otherwise approved by the Engineer.
  - e. Prove the accuracy of the detection system meets requirements in Section 937.2.03C by:
    - Driving a vehicle of known speed through the detection zone and observing and recording the speed calculated by the system. Repeat this measurement at least five times.
    - Perform the above accuracy tests in both rainy and dry conditions.
    - Upon GDOT acceptance of pre installation test results, begin the installation of the WVDS as specified in the plans.
    - If any part of the pre installation test fails, the contractor has up to two subsequent attempts to correct the problem to the satisfaction of the Engineer. All these subsequent tests must be completed within a two week period from the date of initial failure.
2. Post-installation test procedures: Utilize the following test procedures after the WVDS system has been installed in its entirety as shown on the Plans. Commence no post-installation testing until all WVDS systems in the project have been configured and/or calibrated to gather speed, volume, classification, occupancy, and/or presence and programmed to communicate on the GDOT network. Including the accuracy testing requirement, at a minimum, provide the following on the test plan to be submitted and approved by the Engineer:
  - a. Inspect all detection system field components to ensure proper installation and cable termination.
  - b. Verify that field construction has been completed as specified in the plans.
  - c. Inspect the quality and tightness of cable, ground and surge protector connections.

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- d. Check voltage and outputs and ensure device connections are as specified in the Plans and manufacturer recommendations.
- e. Verify that the installation of cables and connections between all APCC's and field cabinets are as specified in the Plans
- f. Demonstrate that each Wireless In-Pavement Vehicle Detection System is fully operational, communicating and gathering the required data types at the specified interval.

#### **937.2.04 Short-Range Radio Device Detector System**

The Short-Range Radio Device Detection System shall be capable of monitoring and measuring vehicular and pedestrian movement by identifying and comparing unique MAC (Media Access Control) addresses associated with Short-Range Radioenabled electronic devices. The system can be used to collect high quality, high-density travel times by sampling a portion of actual travel activity from the traffic stream of a predetermined route. The MAC address received by a sequence of two or more Short-Range Radio Device receivers shall be matched and used to develop a sample of travel time for that particular segment of the roadway, based on the relative detection times recorded by the adjacent units.

The Short-Range Radioenabled device (sensor) shall be an anonymous Short-Range Radio Device MAC address, which is a hardware identifier for the manufacturer and specific electronic device type. MAC addresses are not associated with any specific user account or any specific vehicle. The MAC address shall not be linked to a specific person through any type of central database, but is assigned by the Short-Range Radio Device electronic chip manufacturer and shall not be tracked through the sales chain. Privacy concerns typically associated with alterative probe systems shall be eliminated.

#### **A. Requirements (Type A, Type B, and Type C)**

The Short-Range Radio Device Detection System shall be connected to, and work in conjunction with the support data processing system, located in a designated server at the TMC. All The Short-Range Radio Device Detection units shall adhere to the following requirements:

- Short-Range Radio Device: Class 1 Transceiver with 4 dB to 8 dB Omni Directional Antenna
  - Environmental: - 30°C to +65°C, 5 – 90% humidity
  - Connectivity: IP/Ethernet 10/100 Base-T (minimum)
  - I/O ports: minimum one (1) RJ45 Ethernet port and one (1) RS-232 Configuration Serial Port
1. Short-Range Radio Device Detection System, Type A
    - a. Provide a Short-Range Radio Device Detection System that can be installed in a typical signal or ITS cabinet. The unit shall be enclosed in its own housing and sit on a shelf within the cabinet. Utilize a conduit, as shown on the plans, for routing the antenna cable, and attach the antenna at the location shown on the plans. The power for the Short-Range Radio Device Detection System, Type A unit shall come from typical cabinet power (110 VAC) receptacles or terminal block. Supply all wiring for the Short-Range Radio Device Detection System Type A unit. Should the unit require a POE adapter or transformer to VDC, submit the adapter or transformer to the Department for review. The Contractor shall supply all surge protection devices for the external POE adapter or transformer.
  2. Short-Range Radio Device Detection System, Type B

- a. Provide a Short-Range Radio Device Detection System that is self enclosed in a NEMA 4X enclosure that can be mounted to a pole, mast arm or cabinet structure. The voltage input shall be between 6 and 30 VDC, or be able to connect to 110 VAC with appropriate transformers and adapters, as determined by the Department. The Short-Range Radio Device Detection System Type B unit shall be wired to a cabinet or approved communication/power source, as shown on the plans. The unit shall not reside within the cabinet. Provide all grounding, wiring, adapters, transformers, and surge protection devices needed to support the Short-Range Radio Device Detection System Type B unit, as installed.
3. Short-Range Radio Device Detection System, Type C
    - b. Provide a Short-Range Radio Device Detection System that is self enclosed in a NEMA 4X enclosure that can be mounted to a pole, mast arm or cabinet structure. Provide a Solar Power Array, which includes the solar panel, charging unit and batteries necessary for solar power. The Short-Range Radio Device Detection System Type C unit shall also include a GSM cellular modem with antennas, or approved equivalent. This Short-Range Radio Device Detection System type shall be a completely wireless installation. Provide all grounding, wiring, adapters, transformers, and surge protection devices needed to support the Short-Range Radio Device Detection System Type C unit, as installed.
  4. Short-Range Radio Device Detection System Support Data System Software and Database
    - a. Provide a Support Data System software package, including all necessary database 3<sup>rd</sup> party software required in order for the software to run as intended in support and conjunction of the Short-Range Radio Device sensor system. The software shall be installed on a server designated by the Department. It is the Contractor's responsibility to populate and configure the database for each field Short-Range Radio Device Detection System, and to test the accuracy of the data. The data shall be in an XML format compatible with the Department's central software. The software shall also display a real time chart or graph showing calculated travel time and speeds of the sampled vehicles and MAC address counts. The Short-Range Radio Device Detection System support software is required for all new Short-Range Radio Device Detection System installations, but shall not be required for additional Short-Range Radio Device Detection System sensor installations on an existing network.

**B. Functional Requirements for the Short-Range Radio Device Detection System**

The sensor shall be capable of delivering data from both an Ethernet connection and a GSM wireless modem. The Short-Range Radio Device Detection sensor working in conjunction with the network's support data processing system must deliver real-time speed and travel time information in XML format to the central software system for routes where the sensors are deployed. The system shall be able to add multiple pairs of Short-Range Radio Device Detection sensors to form a network of manageable travel routes. Each route will display the data for the first and last sensor in addition to the travel-time and speed information for that segment. The Short-Range Radio Device Detection sensor shall be able to detect, at a minimum, within a radius of 300 feet when mounted on a pole or mast arm. The data processing shall be able to filter and 'throw out' MAC addresses that do not supply accurate information when compared to other device time stamps of the segment between two Short-Range Radio Detection devices. The data shall be smoothed, and be able to process median and mean average speeds. The following data shall be able to be compared and filtered, as needed, to deliver the most accurate information:

1. Pedestrians
2. Oversize Vehicles
3. Mass Transit (i.e. nearby trains or buses)

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The Short-Range Radio Device Detection System equipment shall contain advanced features designed to allow the unit to operate efficiently in a remote environment. Diagnostic and configuration information shall be able to be viewed remotely, such that the health and operating status of the sensor is known. The system shall be designed to be able to automatically or remotely "reboot" if a condition is detected that requires such action.

### C. Testing

Develop and submit plans for post-installation testing to the Engineer for consideration and approval. Ensure the plans test all functional requirements outlined in Section 937.2.03B. Provide the Engineer with the appropriate XML data interface, as necessary, for testing of the travel time accuracy and integration into the central software.

1. Post-installation test procedures: Utilize the following test procedures after the Short-Range Radio Device Detection System has been installed in its entirety as shown on the Plans. Commence no post-installation testing until all Short-Range Radio Device Detection sensors systems in the project have been configured, calibrated and programmed to communicate on the GDOT network to the support data system software. At a minimum, provide the following on the test plan to be submitted and approved by the Engineer:
  - a. Inspect all Short-Range Radio Device Detection System field components to ensure proper installation and cable termination.
  - b. Verify that field construction has been completed as specified in the plans.
  - c. Inspect the quality and tightness of ground and surge protector connections.
  - d. Check power supply voltage and outputs and ensure device connections are as specified in the Plans.
  - e. Verify that the installation of cables and connections between all Short-Range Radio Device units, antennas and field cabinets and/or components are as specified in the Plans
  - f. Demonstrate that each Short-Range Radio Device unit is fully operational and gathering the required data types at the specified and necessary interval.

### 937.3 Construction/Installation Requirements

This section shall include typical construction requirements for installing and configuring the vehicle detection systems. This specification only gives general requirements of installations. It is the Contractor's responsibility to be fully certified and trained in the detection technology application and the required installation of such devices by the manufacturer. All cable connections shall be manufacturer-rated and secured from outside elements. The Contractor shall be experienced and/or certified in proper cable/connector crimping and manufacturer sealing methods so as to ensure a water-tight and corrosion resistant installation. Wrap all other exposed cable connections with self sealing tape for weatherproofing and moisture seal.

Refer to Subsection 107.07 of the Specifications regarding proper conduct of The Work.

#### 937.3.01 Personnel

All personal shall be fully trained and manufacturer certified in the applicable vehicle detection installation application. When installing into a signal or ramp meter cabinet, the technician shall be minimum International Municipal Signal Association (IMSA) Level II certified.

#### 937.3.02 Equipment

Use machinery such as trucks, derricks, bucket vehicles, saws, trenchers, and other equipment necessary for the work and approved by the Engineer prior to installation operations.

#### 937.3.03 Preparation

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#### Utility Permits

##### A. Application

Apply for, obtain, and pay for utility services, and pole attachment permits required in the Plans.

##### B. Maintenance

Maintain these utility services until Final Acceptance of each installation. After Final Acceptance, transfer these services and permits to the Department, local government or jurisdiction responsible for maintenance and operation. Ensure that the transfer does not interrupt service.

##### C. Utility Location

When installing aerial cable of any type, ensure that overhead clearance and separation requirements conform to local utility company standards, OSHA, the NEC and the NESC. Refer to the Standard Details Drawings for further information on utility clearances.

#### 937.3.04 Fabrication

General Provisions 101 through 150.

#### 937.3.05 Construction

##### A. Video Detection System Installation Requirements

###### 1. General Installation Requirements:

Install all video camera sensors, video detection system processors, output expansion modules, and associated enclosures and equipment at the locations specified in the Plans and per manufacturer recommendations. For traffic signal/ramp meter controller cabinets (Type D, E, and F processors), mount the processor and output expansion modules within the input files, or at a location as designated by the Engineer. Physical changes to the cabinet input files are not permitted. Make all necessary adjustments and modifications to the detection system prior to obtaining recommendation for system acceptance testing. For freeway applications (Type A, B and C processors), install all rack-mounted equipment with one rack unit space between adjacent equipment in the freeway ITS cabinet.

Installation, surge protection and all cabling shall comply with manufacturer's recommendation, at a minimum, or as specified in these plans. All equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully interoperate with all other system components and be fully protected from all surge potential. Connectors installed outside the cabinets and enclosures shall be manufacturer terminated and be corrosion resistant, weather proof, and watertight. Use a UL listed cable that is ozone and UV resistant and weather resistant. Label cables with permanent cable labels at each end.

Wiring and cables must be continuous (without splices) between the VDS camera sensor and processor, except for surge protection connections between sensor and cabinet, so that both the camera and processor are appropriately protected. Coil a minimum of 6 feet of slack in the bottom of the controller or freeway cabinet. Tape ends of unused and spare conductors to prevent accidental contact to other circuits. Label conductors inside the cabinet for the functions depicted in the approved detailed diagrams of the cabinet and VDS documents.

Furnish an as-built cabinet wiring diagram, identified by location, for each VDS cabinet. Include all wiring, cabling, connections, and camera mounting height. Place all documentation in a weatherproof holder in the cabinet.

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For freeway installations (Type A, B and C processors), install VDS power supply or transformer on a standard DIN rail using standard mounting hardware and power conductors wired to terminal blocks in the cabinet.

2. Camera Sensor Installation (all Types)

Adjust the video camera sensor lens to match the width of the road and minimize vehicle occlusion. For Type A camera sensors, aim the camera so that no part of the horizon is in the video image so as to protect it from the effects of the sun. Mount the camera on the specified pole or structure for that location as shown on the plans.

Mounting Bracket Assembly: Mount the video camera sensor on a mounting bracket such that its height and position provide a clear view of the approach or lanes. Mount the video camera sensor securely such that it is stable and steady. The mounting bracket assembly includes a video camera sensor mounting bracket, nipple pipe, cable-mount nipple clamp, and all associated hardware and materials. Mount the video camera sensor on a mounting bracket assembly which meets the following requirements unless otherwise specified in the plans:

- a. Use stainless steel fastening hardware with lock washers on threaded fasteners
- b. Use a video camera sensor enclosure mounting bracket that is non-rusting and is made from die cast aluminum, extruded aluminum, powder-coated galvanized steel or hot dipped galvanized steel. Provide a mounting bracket that permits vertical and horizontal adjustment of the video camera sensor. Provide a mounting bracket that securely fastens to the video camera sensor enclosure and mounts to the nipple pipe by threading onto the pipe or as a slip-fit, using a set-screw fastener in either above method.
- c. Use a 1 1/2" (38 mm) aluminum nipple pipe that is threaded on both ends.
- d. Fasten the nipple pipe to the mast arm using a cable mount nipple clamp with minimum 2 5/16" (58 mm) U bolts. Use aircraft grade galvanized steel cables with stainless steel fastening hardware and that make at least two wraps around the mast arm. Do not use banding straps.

Install all VDS equipment into a cabinet type as shown in the plans with the following equipment:

3. Cabinet Equipment (All Types)

- a. Wiring, Conductors and Terminal Blocks: Use stranded copper for all conductors, including those in jacketed cables, except for earth ground conductors, which may be solid copper. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Route camera control wiring, and 120 VAC power wiring separately. Terminate all wiring on a terminal block, strip, bussbar, or device clamp or lug; do not splice any wiring. Use a minimum #12 AWG for all conductors of 120 VAC circuits, or as recommended by the manufacturer of the VDS device.

Label coaxial cables for VDS cameras. Number all terminal blocks, terminal strips, circuit breakers and bussbar breakers and have each item and each terminal position numbered and named according to function. Labels shall be weather and wear resistant.

- b. Surge Protection: Protect all copper wiring and cabling entering the cabinet housing by surge protection devices as specified in these specifications and per Section 925.2.02 Section A, part 14. Terminate all wiring between cabinet devices and the transient surge protection devices, except for the video signal coaxial feed, on terminal strips. Use a minimum #16 AWG grounding of each surge protection device, or larger if recommended by the surge protection device manufacturer. Do not "daisy chain" with the

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grounding wires of other devices including other surge suppressors. Dress and route grounding wires separately from all other cabinet wiring. Install grounding wires with the absolute minimum length possible between the surge protection device and the ground bussbar. Label all surge protection devices with silk-screened lettering on the mounting panel.

Furnish and install a surge suppressor for each video signal coaxial line. Install a BNC connector, three stage surge protection device for the coax cable that employs gas discharge tubes, series current limiting components, and secondary 'fine' protection. The coax surge protection device shall have a surge current rating of 10 kA. For each cabinet housing, include surge protection devices for the VDS camera power lines installed on the terminal bloc.

All surge protection shall be furnished and installed by the Contractor to protect not only the cabinet processor, but the camera sensor itself from ground rise potential (i.e. surge up to the camera sensor).

- c. Documentation: Provide the following documentation in a waterproof documentation pouch in each cabinet:
  - One operation manual with programming instructions
  - One maintenance manual with schematics
  - Three legible wiring prints showing all VDS components, model and serial number and connections with the cabinet
4. Cabinet Equipment (Type A, B, and C)
  - a. Component Installation: Fasten all components of the cabinet assembly to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. These components include but are not limited to terminal blocks, bussbars, panel and socket mounted surge protection devices, accessory and equipment outlets, and DC power supply chassis. Fasten all other cabinet components with hex-head or Phillips-head machine screws insulated with nuts (with locking washer or insert) or into tapped and threaded holes. All fastener heads and nuts (when used) shall be fully accessible within a complete cabinet assembly, and any component shall be removable without requiring removal of other components, panels, or mounting rails. Do not use self-tapping or self-threading fasteners.
5. Cabinet Equipment (Type D, E, and F)
  - a. Exercise extreme caution when installing VDS equipment and materials at traffic signal/ramp meter installations. Installation technicians accessing a signal cabinet shall be accompanied by a certified (minimum) International Municipal Signal Association (IMSA) Level II traffic signal technician. Repair any damage to existing traffic/ramp meter control equipment and materials which occurred during VDS installation to the Engineer's satisfaction at the Contractor's sole expense.
  - b. In 336S cabinets, locate the VDS power termination panel on the equipment rail in the lower left portion of the rear of the cabinet as shown in the details and plans. Adjust the panel as far toward the cabinet sidewall as possible while still providing access to the circuit breaker. Notify the Engineer immediately if there is any conflict with existing cabinet equipment in this position. Ensure that there is no conflict with door-mounted components when the door is closed.
  - c. In 332 and 334 cabinets, locate the VDS coax termination panel in the lower open section of the front of the cabinet equipment rack as shown in the details. Notify the Engineer immediately if there is any conflict with existing cabinet equipment in this position. Ensure that there is no conflict with door-

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mounted components when the door is closed. Dress, label, and secure all coaxial cabling to and from the coax termination panel such that the panel can be hinged open a minimum of 90 degrees without binding or stressing any coaxial cable.

## B. Microwave Detection System Installation Requirements

### 1. General Installation Requirements

Install all detectors and associated equipment at the locations specified in the Plans. Installation must comply with manufacturer's recommendation. All detector equipment, cables, and hardware must be part of an engineered system that is designed by the manufacturer to fully interoperate with all other system components for the Microwave Detection System. Surge protection devices must be approved by the manufacturer, and must be of quality or better than manufacturer recommendations.

### 2. Detector

Furnish and Install the microwave radar detector on poles as shown in the plans using Contractor supplied materials and brackets. Install the microwave radar detector to achieve the field of coverage shown in the Plans. Aiming and alignment shall be per the manufacturer's recommendations. The Contractor shall verify height requirements based on manufacturer recommendations and shall notify the Engineer should the mounting height vary from the plans. It is the Contractor's responsibility to make all field adjustments to the locations shown in the Plans, in order to match manufacturer recommendations for operation. All field adjustments shall be approved by the Engineer. The Contractor shall use his laptop to setup the detection zones using detector manufacturer specific software. Use only the latest software that is compatible with the detector, as provided by the manufacturer. Use mounting hardware that meets hardware specifications as described in the Video Detection System Installation Requirements, mounting hardware assembly.

### 3. Cabinet Equipment

- a. Wiring, Conductors, and Terminal Blocks: Furnish and Install a manufacturer terminated cable of length necessary for the detector installation. Use only cables provided by the manufacturer of the detection system. The detector end-connector shall be manufacturer assembled and tested prior to installation. It shall be completely watertight and weather resistant. All cabling shall be UV rated for outdoor and underground use. Use only stranded copper for all conductors, including those in jacketed cables, except for earth ground conductors, which may be solid copper. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Route microwave radar detector control wiring and 120VAC power wiring separately so as no transient voltage bleeds over to the detector cable. Terminate all wiring on a terminal block, strip, bussbar, or device clamp or lug; do not splice any wiring from the detector unit to the terminal blocks.

Number and label all terminal blocks, terminal strips, circuit breakers and bussbar breakers and have each item and each terminal position numbered and named according to function. Label terminal blocks, terminal strips, circuit breakers and bussbars with weather and wear resistant labels.

- b. Surge Protection Devices (SPD): Protect all copper wiring and cabling entering the cabinet housing by surge protection devices as specified in this specification and the minimum requirements of Section 925.2.02 Section A, part 14. Terminate all wiring between cabinet devices and the transient surge protection devices and between the microwave radar detection unit and the surge protectors on terminal strips. Use a minimum #16 AWG grounding for each surge protection device, or larger if recommended by the surge protection device manufacturer. Use insulated green wire and connect the

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ground wire directly to the ground bussbar. Do not "daisy chain" with the grounding wires of other devices including other surge protection devices. Dress and route grounding wires separately from all other cabinet wiring. Install grounding wires with the absolute minimum length possible between the suppressor and the ground bussbar. Label all surge suppressors with silk-screened lettering on the mounting panel.

Furnish and install all necessary transient surge protection devices for the microwave radar detection units such that the detector and cabinet equipment are protected.

- c. Component Installation: Fasten all components of the cabinet assembly to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. The components include but are not limited to terminal blocks, bussbars, panel and socket mounted surge protectors, terminal servers, Ethernet switches, circuit breakers, and accessory and equipment outlets. Fasten all other cabinet components with hex-head or Phillips-head machine screws installed with nuts (with locking washer or insert) or into tapped and threaded holes. Fasten stud-mounted components to a mounting bracket providing complete access to the studs and mounting nuts. All fastener heads and nuts (when used) shall be fully accessible within a complete cabinet assembly, and any component shall be removable without requiring removal of other components, panels, or mounting rails. Do not use self-tapping or self-threading fasteners.
- d. As-Built Drawings: Furnish an as-built cabinet wiring diagram, identified by location, for each cabinet. Include label names and numbering, surge protection devices (SPD's), wiring, cabling, and connections. Place all documentation in a weatherproof holder in the cabinet.

#### 4. Cables, Conduit and Power Service

Furnish and install electrical cables used for control, communications signaling and power supply as required by the manufacturer. Do not splice any cable, shield or conductor used for control, communications signaling, or power supply. Identify all conductors of all cables by color and number. Identify the conductor function in as-built documentation included in the cabinet documentation. After termination and dressing the cables in the cabinet, neatly coil and store a minimum of 6 ftof cable slack in the bottom of the cabinet. Cut unused conductors to a length that can reach any appropriate terminal. Bend back unused conductors over their outer jackets and individually tape them.

Install cabling inside new hollow metal or concrete support poles unless otherwise specified. Where devices are installed on existing wood poles, install cabling on the wood poles in rigid metal conduit risers of minimum 2 inch (5.08 cm) diameter. Use weatherheads on all nipple and conduit openings. Neatly install and route cabling to minimize movement in the wind and chafing against the pole, device or bracket. Form a drip loop at the weather head and route cabling to minimize water entry into the cable connector. Use a 24" diameter drip loop where cables enter a weatherhead.

#### 5. As-Built Drawings

Furnish as-built drawings that include the cabinet wiring diagrams as outlined in 2d above. As-built drawings shall include but not be limited to microwave radar detection locations, microwave radar detection mounting heights, and component lists with brand, model and serial numbers. Place one copy of the as-built drawings in the cabinet documentation pouch and submit another copy to the Engineer.

### C. Wireless Magnetometer Vehicle Detection

#### 1. General Installation Requirements

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Each installation of the Wireless Battery-Powered Magnetometer Vehicle Detection System shall consist of one or more sensors installed in the center of each traffic lane, avoiding sources of magnetic noise such as underground power cables, overhead high tension power cables, light rail or subway tracks, and power generation stations and sub-stations.

- a. The sensors shall be located as specified by the plans
- b. For count applications, sensors shall be placed in areas with minimum stop-and-go traffic flow
- c. If vehicle speeds are to be determined by the system, then at least two sensors are required in each lane, separated according to the anticipated average vehicle speed.
  - If the anticipated average vehicle speed is less than 25 mph / 40 kph, the spacing between sensors shall be approximately 10 feet / 3 meters (and measured precisely at the time of installation in order to properly configure the system)
  - If the anticipated average vehicle speed is greater than 25 mph / 40 kph but less than 45 mph / 75 kph, the spacing between sensors shall be approximately 10 to 12 feet / 3.1 to 3.7 meters (and measured precisely at the time of installation in order to properly configure the system)
  - If the anticipated average vehicle speed is greater than 45 mph / 75 kph, the spacing between sensors shall be approximately 20 to 24 feet / 6.1 to 7.3 meters (and measured precisely at the time of installation in order to properly configure the system)

Prior to installation, the contractor shall provide personnel that have been certified by the manufacturer to test and pre-configure the components, including assigning channels and sensors to SPP, RP's, etc. The Contractor shall record all detection component ID numbers on a project plans drawing or intersection detail prior to installation, and supply all drawings showing the recordings as part of the as-builts at the end of the project. The Contractor shall install each sensor in the roadway per Manufacturer's recommendations. The contractor will install Type B sensors for stop bar detection only, where presence is only required, and Type A sensors will be deployed for all other detection applications.

## 2. Sensor Installation:

For a sensor installed just below the roadway surface:

- a. The roadway shall be core drilled to provide a 4" diameter hole, a minimum 2.25" / 5.7 cm deep
- b. The sensor shall be placed inside a small, clear plastic shell formed to provide a tight fit around the sensor.
- c. A small layer of epoxy approximately 1.25" / 3.2 cm shall be applied to the bottom of the cored hole.
- d. The epoxy must adhere to the following requirements:
  - The epoxy shall be a two part poly-urea based joint sealant.
  - It shall have self leveling characteristics.
  - The surface the epoxy will be bonding to shall be free of debris, moisture and anything else which might interfere with the bonding process.
- e. The epoxy shall be approved by the manufacturer of the detection system
- f. The sensor shall then be placed on top of this layer of epoxy in the correct orientation as clearly marked on the sensor

g. The sensor shall be fully encapsulated with the epoxy to the lip of the cored hole

3. Sensor to Repeater, or Sensor to SPP Installation:

The maximum distance between a sensor installed in the roadway and an SPP or an RP with a clear line-of-sight between devices shall be:

- a. At least 175 feet / 53 meters for an SPP or RP installed 30 feet / 9 meters above the roadway
- b. At least 150 feet / 46 meters for an SPP or RP installed 20 feet / 6 meters above the roadway
- c. At least 125 feet / 38 meters for an SPP or RP installed 16 feet / 5 meters above the roadway
- d. The maximum distance between an SPP and an RP or between an RP and another RP shall be at least 750 feet / 228.6 meters when both units are installed 18 feet / 5.5 meters above the roadway and with a clear line-of-sight between devices

4. Repeater to SPP Installation:

Maximum wireless distances shall be based on the following:

- a. SPP or Repeater front of the housing shall be aimed directly at the device (SPP, RP or Sensor) it is communicating with
- b. Deviations from the centerline of the front of the SPP or RP shall reduce the effective distance of communication

**D. Short-Range Radio Device Detection System Installation Requirements**

1. General Installation Requirements

Install the Short-Range Radio Device Detection antenna and/or NEMA 4X enclosure on poles as shown in the plans using Contractor supplied materials and brackets. Install the Short-Range Radio Device Detector to achieve the field of coverage shown in the Plans. Make field adjustments to the locations shown in the Plans only with the Engineer's approval.

The minimum recommended mounting height for the Short-Range Radio Device sensor antenna shall be 10 feet above grade, unless otherwise approved by the Engineer. When using a solar power supply the panel shall be mounted in accordance with environmental and location geographic conditions, and as shown and noted in the plans. It shall be the Contractor's responsibility to tune the sensor for best coverage of the roadway vehicles being detected.

All mounting hardware shall be stainless steel or aluminum, and shall not be susceptible to weather and rusting. Use mounting hardware specifications as outlined in the Video Detection System Installation Requirements. Route all cabling within new conduit, unless otherwise approved by the Engineer. Protect the Short-Range Radio Device processor from the antenna with a surge protection device of specification recommended by the manufacturer.

It is the Contractor's responsibility to populate and configure the database and support data system software package and to test the accuracy of the data. Each Short-Range Radio Device Detector shall be configured in the software and show that it is taking a representative sample of vehicles from the traffic stream.

**937.3.06 Quality Acceptance/Testing**

Should the detection device be on the QPL, the acceptance testing of the vehicle detection systems shall consist of two phases: 1) post installation detection system site testing, as outlined in the specific detection technology

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sections; and 2) burn-in period. If the detection device is not on the QPL, then all Pre-Installation tests shall be performed in the presence of the Engineer. Perform acceptance testing for all equipment, hardware and work provided under this Contract. Perform all testing in the presence of the Engineer. Submit all testing plans and documents to the Engineer during the submittal phase of the vehicle detection equipment.

#### A. Burn-in Period

##### 1. General Requirements

- a. Provide a 30-day burn-in period for all work and equipment included in the Contract and associated with the vehicle detection equipment. The burn-in period shall consist of the field operation of the specific vehicle detection system in a manner that is in full accordance with the requirements of the Plans and Specifications.
- b. Conduct only one (1) burn-in period on the entire Contract for all vehicle detection devices. Commence with the burn-in period only after meeting all of the following requirements:
  - All work required in all Contract documents for the vehicle detection system project-wide has been completed and inspected by the Engineer.
  - Successfully complete the Post-Installation Vehicle Detection System Site Testing.
- c. Commence with the burn-in period upon written authorization by the Department to commence. Terminate the burn-in period 30 consecutive days thereafter unless an equipment malfunction occurs. Stop the burn-in period for the length of time any equipment is defective. After repairing the equipment so that it functions properly, resume the burn-in period at the point it was stopped.
- d. Successful completion and acceptance of the burn-in period will be granted on the 31st day unless any equipment has malfunctioned. If any equipment has failed during the burn-in period, final acceptance will be withheld until all the equipment is functioning properly. The burn-in period shall restart after all equipment has been replaced and/or repaired and tested.
- e. When one specific piece of equipment has malfunctioned more than three times during the 30 day burn-in period, replace that unit with a new unit at no cost to the Department. Multiple failures of detection devices in different locations shall be determined as a failure of the 30 day burn-in period. The Contractor shall investigate the detection system failure and shall give a full report to the Engineer. The Contractor shall replace the failed devices and shall restart the burn-in period at Day 1, once those devices have been replaced and retested.

##### 2. Contractor Responsibilities

During the burn-in period, maintain all work under this Contract in accordance with the Specifications. Restore any work or equipment to proper operating condition within 12 hours after notification.

##### 3. Department Responsibilities

Department responsibilities during the burn-in period will be as follows:

- Expedient notification of Contractor upon failure or malfunction of equipment
- In the event that the Contractor does not provide the services enumerated above under his Contract responsibilities, the Department or its authorized agents may in the interest of public safety take emergency action to provide for adequate traffic control. Pay any costs incurred as a result of these

emergency actions. Such action by the Department will not void any guaranties or warranties or other obligations set forth in the Contract.

#### 4. Burn-In Period Acceptance

The Department will make burn-in period acceptance after satisfactory completion of the required burn-in period and on the basis of a comprehensive field inspection of the complete vehicle detection system in accordance with the Specifications. Upon burn-in period acceptance but prior to Final Acceptance of the entire Contract, maintain the complete vehicle detection system in accordance with the specifications.

### **937.3.07 Contractor Warranty and Maintenance**

Provide all manufacturers' warranties and guarantees for all equipment purchased and turned over to the Department as part of this contract. Ensure equipment provided under this specification shall be warranted by the manufacturer to be free from defects in materials and workmanship for a period of a minimum of three (3) years from Project Final Acceptance.

Ensure that manufacturer's and supplier's warranties and guarantees are transferable to the agency or user that is responsible for maintenance, are continuous throughout their duration and state that they are subject to such transfer.

Ensure the manufacturer will repair any faulty equipment during this period at no charge to the Department for parts, labor or shipping to and from the factory. When the Department detects a failure of any component of the system during the warranty period, the Department will notify the Contractor, Distributor, and/or Manufacturer in writing of the problem.

During the warranty period, supply any firmware or software upgrades associated with the detection system to the Department at no charge. In addition, provide phone consultation as needed at no cost during the warranty period for operating questions or problems that arise.

If the Department desires, it may enter into a separate agreement with the suppliers for technical support and software upgrades. Make available such a program to the Department after the original warranty period.

### **937.3.08 Training**

Provide a minimum of at least eight (8) hours of configuration and maintenance training. The persons to be trained will be determined by the Engineer. Configuration training should last a minimum of three (3) hours and must include instructions for programming, hands on training in programming detection zones, adjusting, and calibrating the detection system. One hands on unit shall be provided per attendee during training. Operation and Maintenance training should last a minimum of five (5) hours and must include instructions on troubleshooting, maintenance, and operation for all detection system components. Each class will have a maximum of eight (8) people. The contractor must provide a training notebook to each trainee and an electronic copy of the training notebook to the Engineer.

The contractor must provide a location for holding the courses and pay all costs associated with travel and accommodation of the trainees if training is conducted away from the project area.

Notify the Engineer 20 days before training and agree on a time and place to conduct the training. If agreement cannot be reached, the Engineer will determine the time.

## **937.4 Measurement**

### **937.4.01 Video Detection System**

#### **A. Video Camera Sensor Assembly (All Types)**

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Video camera sensor assemblies are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install the following minimum items for a video camera sensor assembly.

1. Camera, environmental enclosure, and mounting assembly with all associated hardware.
2. Cabinet equipment, including but not limited to wiring, conductors, terminal blocks, surge protection devices, and mounting panels
3. All weather heads, vertical conduit risers, and conduit hardware on the VDS support pole for power service, grounding, communications, and control. If VDS and CCTV are mounted on the same pole, install common weather heads, conduit risers, and conduit hardware under Section 936 of the Specifications.
4. All hardware and materials necessary to provide electrical power service to the VDS field location as shown in the Plans, including but not limited to vertical sections of conduit, conduit hardware, wire, circuit breakers, disconnect closures, and grounding. The Department will pay for horizontal sections of conduit separately.
5. All cables, connectors, hardware, interfaces, supplies, and any other items necessary for the proper operation and function of any VDS system component to carry video signals to the video detection system processor. All cables shall have manufacturer installed and tested connector ends at the detection side of the cable.

**B. Video Detection System Processor (All Types)**

Video detection system processors are measured for payment per each actually installed, configured, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install a video detection system processor to include, at a minimum, the following:

1. Video detection system processor module
2. Appropriate power supplies, power and communication wiring.
3. Necessary housing and rack assemblies for processors that do not plug directly into signal cabinet input files
4. System software provided within the video detection system processor and configuration software

**C. Output Expansion Module**

Output expansion modules are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install an Output Expansion Module to include, at a minimum, the following:

1. Output expansion module
2. Any cabling and hardware required to connect to the processor module or additional expansion modules to the cabinet and controller input pins

**D. Testing**

Testing is measured as a lump sum for full delivery of testing and acceptance requirements.

**E. Training**

Training is measured as a lump sum for all supplies, equipment, materials, handouts, travel, and subsistence necessary to conduct the training.

**937.4.02 Microwave Radar Detection**

**A. Microwave Radar Detector Assembly**

Microwave radar detection assemblies are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install the following minimum items for a microwave detection assembly:

1. Microwave radar detector (including housing)
2. Field cabling surge protection devices, and cabinet equipment. Field cable shall have manufacturer installed end connector at the detection end
3. Power supply modules
4. Serial communication modules
5. Local communication modules
6. Mounting bracket(s)
7. All weatherheads, vertical conduit risers, and conduit hardware on the support pole for power and detector signal as shown in the plans
8. Configuration and Software

**B. Testing**

Testing is measured as a lump sum for full delivery of testing and acceptance requirements.

**C. Training**

Training is measured as a lump sum for all supplies, equipment, materials, handouts, travel, and subsistence necessary to conduct the training.

**937.4.03 Wireless In-Pavement Vehicle Detection**

**A. Sensor (All Types)**

Sensors are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install the following minimum items for a sensor detection assembly:

1. Sensor
2. Epoxy
3. Core Drilling and Placement
4. Sensor plastic enclosure
5. Configuration and Software

**B. Access Point Contact Closure (All Types)**

Access Point Contact Closure assemblies are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, the APCC shall include all configuration, software, enclosures, surge protection devices and power supplies, as necessary for a full installation. Provide all modules and cabling with the APCC for connection directly into an Ethernet switch.

**C. Wireless Repeater**

Repeaters are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install the following minimum items for a wireless repeater assembly:

1. Repeater including housing
2. 7-year battery
3. Mounting hardware
4. Configuration and Software

**D. Serial Port Protocol Unit (SPP)**

SPP's are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install the following minimum items for a SPP assembly:

1. Radio unit including housing
2. Cabling, surge protection devices and connectors from unit to cabinet
3. Mounting hardware
4. Configuration and Software

**E. Expansion Contact Closure Card**

Expansion Contact Closure Cards (EX) are measured for payment per each actually installed, complete, functional, and accepted. The EX card shall include all configuration to provide a full contact closure detection system.

**F. Isolator Module**

Isolator Modules are measured for payment per each actually installed, complete, functional, and accepted. Unless otherwise specified in the Plans, furnish and install the isolation module at all locations the Wireless In-Pavement Detection System is called out in the plans. Ensure that the isolation module is installed per the manufacturer recommendation and is providing protection and amplification of the signal. This shall include all configuration of the unit.

**G. Input/Output Module**

Input/Output Modules are measured for payment per each actually installed, complete, functional, and accepted. Ensure that the Input/Output module is installed per the manufacturer recommendation and is providing the correct communications options necessary for the installation. This shall include all configuration of the unit.

**H. Testing**

Testing is measured as a lump sum for full delivery of testing and acceptance requirements.

**I. Training**

Training is measured as a lump sum for all supplies, equipment, materials, handouts, travel, and subsistence necessary to conduct the training.

**937.4.04 Short-Range Radio Device Detection System(All Types)**

**A. Short-Range Radio Device Detection System (All Types)**

Short-Range Radio Device Detectors are measured for payment per each actually installed, complete, functional, and accepted. Each type of system shall be complete, installed and in place and include all units necessary for full

operation, as determined by Type. Unless otherwise specified in the Plans, furnish and install the following minimum items for a Short-Range Radio Device Detection assembly:

1. Short-Range Radio Device Detection assembly, including housing and necessary power supplies
2. Power and communications cabling
3. Antenna and mounting hardware
4. Surge Protection Devices
5. Cellular Modem (if applicable)
6. Solar Panel Array (if applicable)
7. Solar Battery charger (if applicable)
8. Batteries (if applicable)
9. NEMA 4X Enclosure (if applicable)
10. Configuration

**B. Short-Range Radio Device Detection System Support Data System Software and Database Package**

Short-Range Radio Device Detection System software and database packages are measured for payment per each package actually installed, complete, functional, and accepted. Each type of system shall be complete, installed and in place. Unless otherwise specified in the Plans, furnish and install the following minimum items for Short-Range Radio Device Detection System software:

1. Installation of the Software on a Department determined server
2. Installation of the Database software on a Department determined server
3. Configuration of the Short-Range Radio Device Detection System units and initial testing on the software
4. Testing of the XML data and interface to the central system

## **937.5 Payment**

**A. General**

All Vehicle Detection assemblies, complete in place and accepted by the Department after a successful 30 day burn-in period, are paid for at the Contract Unit Price. Payment is full compensation for furnishing and installing the vehicle detection technology as shown on the plans.

**B. Testing**

The Department will pay for testing performed as prescribed by this Item, measured as provided under Measurement at the Lump Sum Contract bid price.

**C. Training**

Training is paid for as a lump sum for all supplies, equipment, materials, handouts, travel, and subsistence necessary to conduct the training, measured as provided under Measurement at the Lump Sum Contract bid price

Payment is full compensation for furnishing and installing the items complete in plans according to this Specification.

C-

Payment will be made under:

Item No. 937	Video Camera Sensor Assembly, Type_	Per Each
Item No. 937	VDS System Processor, Type _	Per Each
Item No. 937	Output Expansion Module, Type _	Per Each
Item No. 937	Testing - Video Detection System	Lump Sum
Item No. 937	Training - Video Detection System	Lump Sum
Item No. 937	Microwave Radar Detection Assembly	Per Each
Item No. 937	Testing - Microwave Detection System	Lump Sum
Item No. 937	Training - Microwave Detection System	Lump Sum
Item No. 937	Wireless Magnetometer Sensor Type _	Per Each
Item No. 937	Access Point Contact Closure Type _	Per Each
Item No. 937	Wireless Repeater	Per Each
Item No. 937	Serial Port Protocol Unit	Per Each
Item No. 937	Expansion Contact Closure Card	Per Each
Item No. 937	Isolator Module	Per Each
Item No. 937	Input/Output Module	Per Each
Item No. 937	Testing – WMVD System	Lump Sum
Item No. 937	Training – WMVD System	Lump Sum
Item No. 937	Short-Range Radio Device Detection System Type _	Per Each
Item No. 937	Short-Range Radio Device Support Data Processing Software Package	Per Each
Item No. 937	Testing – Short-Range Radio Device Detection System	Lump Sum
Item No. 937	Training – Short-Range Radio Device Detection System	Lump Sum

# NOTICE TO ALL BIDDERS

To report bid rigging activities call:

**1-800-424-9071**

The U.S. Department of Transportation (DOT) operates the above toll-free “hotline” Monday through Friday, 8:00 AM to 5:00 PM, Eastern Time. Anyone with the knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the “hotline” to report such activities.

The “hotline” is part of the DOT’s continuing effort to identify and investigate highway construction contract fraud and abuse, and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected