SECTION FOUR

COBB COUNTY WATER SYSTEM SPECIFICATIONS

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparing and processing of submittals for review and action.
2. Preparing and processing of informational submittals.

B. Submit the following for the **Owner's** review and action:

1. Shop drawings.
2. Product data.
3. Samples.
4. Submittals indicated as "for approval."

C. Submit the following as informational submittals:

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

D. Specific submittals are described in individual sections.

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

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

G. Submit all submittals to the **Owner.**

H. Do not include requests for substitution (either direct or indirect) on submittals; comply with procedures for substitutions specified in Section 01 60 00 - Product Requirements.

1.02 DEFINITIONS

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

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

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

D. Informational Submittals: Submittals identified in the Contract Documents as for information only.

1.03 FORM OF SUBMITTALS

A. Submittals shall, unless specifically accepted, be made in electronic format. Detailed procedures for handling electronic submittals will be discussed at the preconstruction conference.

1. Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.
2. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.
3. PDF files shall be set to open “Bookmarks and Page” view.
4. Add general information to each PDF file, including title, subject, author, and keywords.
5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.
6. Submit new electronic files for each resubmittal.
7. Include a copy of the Transmittal of Contractor’s Submittal form with each electronic file as described in paragraph 3.02D.3 below.
8. **Owner** will reject submittal that is not electronically submitted, unless specifically accepted.
9. Provide **Owner** with authorization to reproduce and distribute each file as many times as necessary for Project documentation.

B. Samples:

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

1.04 COORDINATION OF SUBMITTALS

A. Coordinate submittals and activities that must be performed in sequence or of different types for the same product or system so that the **Owner** has enough information to properly review each submittal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TIMING OF SUBMITTALS

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

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

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

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

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

3.02 SUBMITTAL PROCEDURES - GENERAL

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

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

C. Preparation of Submittals:

1. Label each copy of each submittal, with the following information:
    a. Project name.
    b. Date of submittal.
    c. Contractor’s name and address.
    d. Supplier’s name and address.
    e. Manufacturer’s name.
    f. Specification section where the submittal is specified.
    g. Numbers of applicable drawings and details.
    h. Other necessary identifying information.

D. Transmittal of Submittals:

1. Submittals will be accepted from the **Contractor** only.
2. Submittals received without a transmittal form will be returned without review or action.
3. Transmittal form: Use a form acceptable to the **Owner**; provide space on form for:
    a. Project name.
    b. Submittal date.
    c. Transmittal number.
    d. Specification section number.
    e. To.
    f. From.
    g. Contractor’s name.

h. Subcontractor's and supplier's names.
i. Manufacturer's name.
j. Submittal type (shop drawing, product data, sample, informational submittal).
k. Description of submittal.
l. Action marking.
m. Comments.

4. Fill out a separate transmittal form for each submittal; also include the following:
   a. Other relevant information.
   b. Requests for additional information.

3.03 SHOP DRAWINGS

A. Content: Include the following information:

1. Dimensions, at accurate scale.
2. All field measurements that have been taken, at accurate scale.
3. Names of specific products and materials used.
4. Details, identified by contract document sheet and detail numbers.
5. Show compliance with the specific standards referenced.
6. Coordination requirements; show relationship to adjacent or critical work.
7. Name of preparing firm.

B. Preparation:

1. Reproductions of contract documents are not acceptable as shop drawings.
2. Copies of standard printed documents are not acceptable as shop drawings.
3. Identify as indicated for all submittals.

3.04 PRODUCT DATA

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

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

C. Content:

1. Submit manufacturer's standard printed data sheets.
2. Identify the particular product being submitted; submit only pertinent pages.
3. Show compliance with properties specified.
4. Identify which options and accessories are applicable.
5. Include recommendations for application and use.
6. Show compliance with the specific standards referenced.

7. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
8. Identify dimensions which have been verified by field measurement.
9. Show special coordination requirements for the product.

3.05 SAMPLES

A. Samples:

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

B. Preparation:

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

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

3.06 REVIEW OF SUBMITTALS

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

B. Informational Submittals: Submittals will be reviewed.

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

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

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

A. Except for samples, submittals will be returned to the **Contractor** electronically. Samples will be returned to the **Contractor** by mail.

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

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

C. Distribution: Make one copy for project record documents.

END OF SECTION

SECTION 01 57 28
TEMPORARY FLOW CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Owner will provide the flow rate requirements for bypass systems in the contract documents.

B. The Contractor shall provide all materials, labor, and equipment to install, test, and maintain a temporary bypass pumping system for the purpose of all diverting sewer flows around the work area.

C. It is imperative that the functioning of the wastewater collection system be maintained throughout the construction period. A reliable temporary bypass pumping system must be provided to ensure uninterrupted sewer service in the area.

1.02 RELATED WORK

A. Section 33 31 00 - Sanitary Sewer Piping.

1.03 UNIT RESPONSIBILITY

A. Bypass pumps, piping, and associated accessories shall be provided by a single supplier to ensure a completely integrated and functional system.

1.04 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00 - Submittal Procedures.

B. The Contractor shall develop a bypass pumping plan, provide all equipment necessary for bypass pumping, and maintain the equipment throughout the duration of the work. The Contractor shall submit the bypass pumping plan, including all product and design data and operating calculations, to CCWS Engineering for verification. The bypass pumping plan must be designed by a Professional Engineer licensed in the state of Georgia. The bypass pumping plan shall include the following information as a minimum:

1. Bypass pump sizing criteria (such as, force main size and length, static and dynamic head, flow velocity, maximum wastewater level depths in manholes upstream of bypass pump operations) and resulting capacity, number of each size to be on site, and power/fuel requirements.
2. Pump curves showing the pump operating range shall be submitted.
3. Method of noise control for each pump and/or generator; calculations demonstrating the expected attenuated noise levels (in decibels) at nearest residence.
4. Staging area for pumps and piping, ensuring staging area is within the Owner’s property or easements.

5. Number, size, material, location, and method of installation of suction and discharge piping; sewer plugging method and types of plugs; thrust and restraint block sizes and locations; temporary pipe supports and anchoring.
6. Schedule for installation and maintenance of bypass pumping system.
7. Testing procedures and qualification requirements for personnel completing daily inspection as listed in Section 3.01.
8. Clean up plan including a subcontractor that is certified by Institute of Inspection, Cleaning, and Restoration Certification (IICRC): and shall follow IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration.

1.05 ENVIRONMENTAL PROTECTION

A. The Contractor shall take necessary precautions to ensure that bypass operations do not result in sewer overflows, sewer backups, or related threats to the public health and do not cause flooding or damage to public or private property.

B. Pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic and shall be redirected to the sanitary sewer system. Traffic Control plans shall be submitted if necessary. Dumping or free flow of sewage on public and private property, gutters, streets, sidewalks, or into storm sewers is prohibited.

C. Should any liquid or solid matter from the sewer collection system be spilled, discharged, leaked, or otherwise deposited to the environment, the Contractor shall immediately clean and disinfect the affected area and notify the Owner.

D. Any sewer overflows, backups, leaks, or property damage resulting from improper setup or failure of the bypass pumping system shall be the responsibility of the Contractor. The Contractor shall be responsible for any fines, for the complete cleanup of such spills, and for restoration of damaged property at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 BYPASS PUMPS

A. The bypass pumps used shall be fully automatic, self-priming units. Pumps shall possess dry-running capabilities to accommodate the diurnal, cyclic nature of wastewater flow.

B. Bypass pumps shall be of sufficient capacity to accommodate the daily peak sanitary sewer flows plus any additional flows due to rain events.

C. Bypass pumps may be driven by either electric motor or diesel engine.

1. Diesel engines must be provided with acoustic enclosures to minimize noise.

2. The Contractor is responsible for providing all necessary and required power and control wiring and associated electrical devices when using electric motors.

D. Unless otherwise specified or approved by the Owner, the pumping equipment shall be sound attenuated; noise levels shall not exceed 75 decibels at 23 feet.

E. The Contractor shall also provide a redundant back-up, onsite bypass pumping system that will automatically energize upon a high-water level, indicating the failure of the primary bypass pumping unit. The back-up system shall be equal in all respects to the primary system.

F. The bypass pumping system shall include provisions for continuous remote monitoring and alarm notification utilizing a wireless, web-based system. Any alarms shall automatically contact the Contractor and the CCWS Emergency Dispatch Call Center (770-419-6201). The Contractor is responsible for response and resolution of the alarm condition; the CCWS notification is only for informational purposes.

G. For any projects involving construction at an existing CCWS sewage pump station, the Contractor shall provide all signal wiring and connections from the bypass pump system to the existing local SCADA panel. The Contractor shall make any temporary provisions to keep the existing SCADA panel operational while bypass pumping, including, but not limited to, supports and electrical and signal wiring. The Contractor shall notify the Water System's Water Protection Division Information Technology Group prior to making final connections to the SCADA panel. The following signals will be provided to the SCADA panel:

1. Primary Bypass Pump: On/Off.
2. Back-up Bypass Pump: On/Off.
3. High water level.

H. The bypass pump equipment supplier shall provide technical support and service 24 hours/day, 7 days/week.

PART 3 EXECUTION

3.01 BYPASS PUMPING

A. The Contractor shall coordinate the bypass pump installation and start-up with the Owner, specifically to include Water Protection Division personnel.

1. Minimum of 48 hours advance written notice must be given before starting bypass operations. The bypass pumping system must be hydrostatically tested to 1.5 times the working pressure of the system. The bypass pumping system must be tested for a minimum of 24 hours without incident prior to taking any part of the collection system, including pump stations, out of service; any incident shall restart the test period. Bypass operations may not start or restart on Fridays.

2. The Owner reserves the right to delay the start of bypass operations (for example, in the event of forecasted adverse weather).

B. The complete bypass pumping system shall be inspected daily by qualified personnel.

C. The Contractor assumes operational responsibility of the affected portions of the collection system throughout the duration of bypass pumping operations. The Contractor shall be on-call at all times to respond to all alarm conditions and/or failure of the bypass pumping system.

D. The bypass pumping system shall remain onsite for immediate connection and use, if necessary, until the start-up testing period (24-hour minimum) for the completed work has been successfully completed.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. General product requirements, including:
   a. General specification requirements for all products.
   b. Product options.
   c. Procedures for substitution requests.
2. General procedures for products including:
   a. Procedures for transportation and handling.
   b. Procedures for delivery and receiving.
   c. Procedures for storage.

1.02 DEFINITIONS

A. Damage: Any sort of deterioration whether due to weather, normal wear and tear, accident, or abuse, resulting in soiling, marring, breakage, corrosion, rotting, or impairment of function.

1.03 SUBMITTALS

A. Schedule of Products: Submit for approval.

B. Final Schedule of Products: Submit for project record.

PART 2 PRODUCTS

2.01 GENERAL

A. Components required to be supplied in quantity within a specification section shall be identical, interchangeable, and made by the same manufacturer.

B. Do not use products removed from existing construction, unless specifically permitted by the contract documents or approved by the **Owner**.

C. When material or equipment is specified by reference to two (2) or more brand names or catalog numbers, it shall be understood that these references are for the purpose of defining the performance, or other salient requirements, and that other materials or equipment, of equal capacities, quality and function, shall be considered by the **Owner** upon the **Contractor's** request for substitution.

D. If material or equipment is specified by only one patent or proprietary name or by the name of only one manufacturer, it is for the purpose of standardization, or because the **Owner** knows of no equal.

E. Any material, article or equipment of other manufacturers and vendors, which will perform adequately the duties imposed by the general design, will be considered equally acceptable provided the material, article or equipment so proposed, is in the opinion of the **Owner**, of equal substance and function. It shall not be purchased or installed by the **Contractor** without the **Owner's** written approval.

PART 3 EXECUTION

3.01 PRODUCT OPTIONS

A. It is the **Contractor's** responsibility to select products which comply with the Contract Documents and which are compatible with one another, with existing work, and with products selected by other contractors.

B. Do not use any substitute products which have not been approved in accordance with the requirements of the contract documents.

C. Definition of Substitute Product: Any product which does not meet the requirements of the contract documents, whether in product characteristics, performance, quality, or manufacturer or brand names, is considered a substitute.

D. Product Options: Where products are specified using more than one method, such as description with a manufacturer list, use a product meeting the requirements of both specification methods.

E. Products Specified by Reference Standard: Use any product meeting the specification.

F. Products Specified by Description: Use any product meeting the specification.

G. Products Specified by Performance Requirements: Use any product meeting the specification.

H. Products Specified by Listing a Brand Name Product as the "Basis of Design": Provide a product equivalent to the product specified within the limits of variation specified. Use of a product other than that specified constitutes a representation by the **Contractor** that he will comply with all the conditions specified for acceptance of substitutions.

I. Language indicating that substitutions are not allowed includes:

1. "Provide one of the following products."
2. "Provide products made by one of the manufacturers listed."
3. "Provide products complying with the contract documents and made by one of the following."
4. "No substitutions."
5. Other similar language.

J. Language indicating that substitutions are allowed includes:

1. Substitutions will be considered.
2. "... will be among those considered acceptable."
3. Other similar language.

3.02 PRODUCT SUBSTITUTION

A. Reference the General Conditions - Section 00 72 13 4.05 (Requests for Substitution).

B. Submission of request for substitution shall constitute a representation that the **Contractor**:

1. Has investigated the proposed product and determined that it is equal to or better than the specified product.
2. Will provide the same warranty for the proposed product as for the specified product.
3. Will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including:
   a. Redesign.
   b. Additional components and capacity required by other work affected by the change.

C. Substitutions will not be considered when:

1. Acceptance would require substantial revision of the contract documents.
2. They are indicated or implied on shop drawing or product data submittals without separate written request.

D. Substitution Request Submission:

1. Submit electronically in in Adobe Acrobat Portable Document Format (PDF) with accompanying data.
2. Submit all requests on a standard form.
3. Only one request for substitution will be considered for each product.

E. Data Required with Substitution Request: Submit written request with complete data substantiating compliance of the proposed product with the requirements of the Contract Documents. Provide at least the following data:

1. Identify product by specification section and paragraph number.
2. Manufacturer's name and address, trade name and model number of product (if applicable), and name of fabricator or supplier (if applicable).
3. Complete product data.
4. A list of other projects on which the proposed product has been used, with project name, the design professional's name, and owner contact.
5. An itemized comparison of the proposed product to the specified product.
6. Net amount of change to the contract sum.
7. List of maintenance services and replacement materials available.

8. Statement of the effect of the substitution on the construction schedule.
9. Description of changes that will be required in other work or products if the substitute product is approved.

3.03 SCHEDULE OF PRODUCTS

A. Prepare a complete schedule of products used, including the following for each product:

1. Manufacturer's name.
2. Brand or trade name.
3. Model number, if applicable.
4. Reference standard, if more than one is applicable.
5. Arrange products in the schedule by specification sections; indicate paragraph where specified.

B. Schedule of products shall not be used to obtain approval of substitute products; make separate request for substitution.

3.04 TRANSPORTATION AND HANDLING

A. Require supplier to package finished products in a manner which will protect from damage during shipping, handling, and storage.

B. Transport products by methods which avoid damage.

C. Deliver in dry, undamaged condition in manufacturer's unopened packaging.

D. Provide equipment and personnel adequate to handle products by methods which prevent damage.

E. Provide additional protection during handling where necessary to prevent damage to products and packaging.

F. Lift large and heavy components at designated lift points only.

3.05 DELIVERY AND RECEIVING

A. If storage area is not available on site, arrange deliveries so that storage is not required.

B. Arrange deliveries of products to allow time for inspection prior to installation.

C. Coordinate delivery to avoid conflict with the work and to take into account both the conditions at the site and the availability of personnel, handling equipment, and storage space.

D. Clearly mark partial deliveries to identify contents, to permit easy accumulation of entire delivery, and to facilitate assembly.

E. Promptly inspect shipments and remedy damage, incorrect quantity, incompleteness, improper or illegible labeling, and noncompliance with requirements of contract documents and approved submittals.

3.06 STORAGE

A. If authorized by the **Owner**, partial payment may be made for off-site storage of products. The **Contractor** shall provide evidence of full coverage insurance for any products stored at a facility outside of the project site.

B. General Storage Procedures:

1. Store products immediately on delivery.
2. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
3. Store in a manner to prevent damage to the stored products and to the work.
4. Store moisture-sensitive products in weathertight enclosures.
5. Store indoors if necessary to keep temperature and humidity within ranges required by manufacturer.
6. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
7. Arrange storage to provide access for inspection and inventory.
8. Periodically inspect and remedy damage and noncompliance with required conditions.

END OF SECTION

SECTION 01 78 36
WARRANTIES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compile specified warranties.

B. Co-execute submittals when so specified.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to the **Owner** for review.

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Two each.

1.03 FORM OF SUBMITTALS

A. Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.

1. Cover: Identify each packet with typed or printed title “WARRANTIES” List:
   a. Title of Project.
   b. Name of Contractor.
2. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.
3. PDF files shall be set to open “Bookmarks and Page” view.
4. Add general information to each PDF file, including title, subject, author, and keywords.
5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.
6. **Owner** will reject submittal that is not electronically submitted, unless specifically accepted.
7. Provide **Owner** with authorization to reproduce and distribute each file as many times as necessary for Project documentation.

1.04 WARRANTY REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer’s warranty period shall be concurrent with

the **Contractor's** for one (1) year commencing at the time of acceptance by the **Owner**.

B. The **Contractor** shall be responsible for obtaining certificates for equipment warranty for all major equipment specified herein which lists for more than $1,000. The **Owner** reserves the right to request warranties for equipment not classified as major. The **Contractor** shall still warrant equipment not considered to be "major" in the **Contractor's** 1-year warranty period even though certificates of warranty may not be required.

C. Equipment shall be warranted to be free from defects in workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it shall be replaced and the equipment restored to service at no expense to the **Owner**.

D. The manufacturer's warranty period shall run concurrently with the **Contractor's** warranty or guarantee period. No exception to this provision shall be allowed.

E. Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The **Contractor** is responsible for the cost of replacing or rebuilding defective work regardless of whether the **Owner** has benefited from use of the work through a portion of its anticipated useful service life.

F. When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

G. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

H. Written warranties made to the **Owner** are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

I. The **Owner** reserves the right to reject warranties and to limit selections to Products with warranties not in conflict with requirements of the Contract Documents.

J. The **Owner** reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

K. Manufacturer's disclaimers and limitations on product warranties do not relieve the **Contractor** of the warranty on the work that incorporates the

products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the **Contractor**.

L. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the **Owner**.

M. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the **Owner**.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Record documents refer to those documents maintained and annotated by the **Contractor** during construction to provide a record of the Work as installed. The Record Drawings are defined as a neatly and legibly marked set of Contract Drawings showing the final location of piping, valves, fittings, and equipment. The Record Drawings shall show field changes, changes by change order, and details not shown on the original Contract Drawings.

1.02 SUBMITTALS

A. Submit one set of Record Drawings and one copy of the Record Survey (if required) in accordance with Substantial Completion Procedures (00 72 13, 6.05). The **Owner** may withhold declaring the project substantially complete and shall withhold Final Payment until acceptable Record Drawings are submitted.

1.03 QUALITY ASSURANCE

A. The Record Drawings shall be maintained continuously. Prior to each request for partial progress payment, the **Owner** may review the Record Drawings with the **Contractor**. Progress payments may be withheld or reduced if Record Drawings are not current.

B. In addition to the annotated Contract Drawings, the **Contractor** shall provide a Record Survey of sanitary sewer lines installed as a part of the Work. This Record Survey shall be prepared under the supervision of, and be sealed by, a Land Surveyor registered in the State of Georgia.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Unless otherwise required, the Record Drawings shall be a full-size set of the Contract Drawings maintained in a clean, dry, and legible condition. Each drawing shall be marked “RECORD DRAWING” in large, clear print. Annotations on the drawings should be made with red pencil or red ink. Record Drawings shall not be used for construction purposes.

B. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. Do not conceal any work until required information is recorded.

C. If the project consists of both water line work and sanitary sewer work, the Record Drawings for each shall be maintained separately. Additional sets of the Contract Documents will be furnished by the **Owner** for Record Drawing purposes.

D. The **Contractor's** name, address and telephone number shall be shown on each sheet. The date(s) of installation of the Work shall also be shown on each sheet of the plan set.

3.02 WATER LINE RECORD DRAWINGS

A. In addition to the information shown on the Contract Drawings, the Water Line Record Drawings must contain the following information:

1. Pipe size, material, and pressure class.
2. Manufacturer's name and model number of fire hydrants and valves; date of manufacture.
3. Horizontal location of water lines, valves, fire hydrants, service connections, meters, air release valves and all other appurtenances. Location to be referenced to horizontal control system shown on the Contract Drawings (e.g., station and offset). If the location is identical to that shown on the Contract Drawings, indicate with the annotation "As Installed".
4. Vertical location of water lines at crossings of creeks, storm drains, sanitary sewers, and other utilities. Also indicate any other locations where the depth of the water lines are other than standard depth.
5. Detailed sketches, with dimensions, of connections of water mains, including valves and fittings.

3.03 SANITARY SEWER RECORD DRAWINGS

A. In addition to the information shown on the Contract Drawings, the Sanitary Sewer Record Drawings must contain, as a minimum, the following information:

1. Pipe material.
2. Manhole type, if other than standard (such as, drop, doghouse).
3. Pipe size and slope and length between manholes. Slope shown as percent to the nearest hundredth; length to the nearest tenth of a foot.
4. All pipe end inverts (ins and outs) to the nearest hundredth of a foot.
5. Manhole rim elevation to the nearest hundredth of a foot.
6. Ground elevation at each manhole to the nearest tenth of a foot.
7. Stationing between manhole centers to the nearest tenth of a foot.
8. Relative horizontal angle between all pipes entering and exiting manholes; to the nearest second.
9. Horizontal location of service laterals, stationed along sewer centerline from manholes.
10. Invert elevation of lateral at right-of-way or easement limit; required only if lateral depth is other than standard shallow service connection.

B. If the project includes a sewage pump station and force main, provide the following information:

1. Elevations to accuracy noted, using site benchmark as reference, including:
    a. Wet well top slab, bottom slab, invert of incoming gravity sewers, and centerline of pump discharge lines exiting; hundredths of a foot.
    b. Equipment building slab; hundredths of a foot.
    c. Generator slab; hundredths of a foot.
    d. Ground at wet well and at fence corners; tenths of a foot.
    e. Centerline of access road, on 50-foot centers; tenths of a foot.
2. Site, mechanical and electrical drawings, marked to show any changes.
3. Equipment manufacturer names and model numbers (including, pumps, valves, generator).
4. Force main pipe size and material.
5. Horizontal location of force main, air release valves and all other appurtenances. Location to be referenced to horizontal control system shown on the Contract Drawings (such as, station and offset). If the location is identical to that shown on the Contract Drawings, indicate with the annotation “As Installed”.
6. Vertical location of force main at crossings of creeks, storm drains, water lines, and other utilities. Also indicate any other locations where the depth of the force main is other than standard depth.

3.04 SANITARY SEWER RECORD SURVEY

A. As noted in Paragraph 1.03.B above, the **Contractor** shall provide a Record Survey of sanitary sewer lines installed as a part of the Work, in addition to the annotated Contract Drawings submitted as Record Drawings. The Record Survey must include, as a minimum, the following information:

1. Pipe size and slope and length between manholes. Slope shown as percent to the nearest hundredth; length to the nearest tenth of a foot.
2. All pipe end inverts (ins and outs) to the nearest hundredth of a foot.
3. Manhole rim elevation to the nearest hundredth of a foot.
4. Ground elevation at each manhole to the nearest tenth of a foot.
5. Ground profile along centerline of sewer between manholes; to the nearest tenth of a foot.
6. Manhole stationing to the nearest tenth of a foot.
7. Relative horizontal angle between all pipes entering and exiting manholes; to the nearest second.

B. The Record Survey must be referenced to the horizontal and vertical controls shown on the Contract Drawings. The coordinates of the manholes shall be presented in tabular form on each sheet of the set.

C. Each drawing shall indicate the Cobb County Water System project name and project number, the **Contractor’s** name, address and telephone number, the surveyor’s name, address and telephone number, and the surveyor’s seal.

END OF SECTION

SECTION 02650 - MANHOLE FRAME AND COVER ADJUSTMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section addresses the adjustment to grade and/or replacement of manhole frames and covers for both in-pavement and out-of-pavement structures

B. The Contractor shall be responsible for the following:

1. Furnishing all labor, equipment, and materials necessary to complete the work.

2. Compliance with Cobb County Department of Transportation and/or Georgia Department of Transportation guidelines for work zone establishment, traffic control, authorization to perform work within roadways and right-of-ways, material specifications, etc.

3. Compliance with Cobb County Community Development regulations in regards to erosion and sedimentation control.

4. Negotiations and obtaining (in writing) any necessary permission to enter private property to access work areas.

5. Protect or re-establish existing drainage ways or easements which may be impacted during work activities.

6. Repair of any manholes damaged as a result of work activities

C. The Owner will provide maps of the sewer collection systems' (via electronic PDF format) and other location details based on the best information currently and readily available for the Contractor's use in establishing the general location of a manhole. The Contractor is responsible for further location efforts (electromagnetic devices, survey measurement/alignment, etc.) to properly identify the work order location.

D. Water supply for concrete mix preparation shall be from an authorized, metered source. Fire hydrant meter(s) are available for rental from the Cobb County Water System

1.02 WARRANTY

A. A written two year warranty covering all workmanship and materials shall be provided by the Contractor for each adjustment from the date of the completion of the work order.

1.03 SUBMITTALS

A. Submit shop drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01300 (Submittals) of these Specifications.

B. Submit to owner the detailed mix design information (compressive strength, curing time, availability to introduce traffic loads, etc.) for the concrete

C. Submit a letter from the rapid-set cement manufacturer certifying that all products proposed for use in conjunction with the cement have been reviewed (including the dye/ staining agent, curing and sealing compound, and crack sealant) and have been determined to be compatible with the cement material when used as intended in this project.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials and products utilized in the execution of the work shall be in accordance with these Specifications and the subject to the inspection, testing, and approval of the Owner.

2.02 MATERIALS

A. Manhole Frames and Covers

1. Standard manhole frames and covers shall be furnished and installed on manholes in roadways and in maintained right-of-ways (unless located in direct drainage ways). Standard manhole frames and covers shall be East Jordan Iron Works Model V-1480, U.S. Foundry Model USF 360-E, or approved equal.

2. Bolt-down, watertight frames and covers shall be furnished and installed on manholes along easements for outfall collector and interceptor sewers, in drainage ways, and elsewhere as directed. Bolt-down, watertight fames and covers shall be East Jordan Iron Works Model V2480, U.S. Foundry USF 360-E / ORS, or approved equal with rubber gasket. Two (2), 5/8-inch diameter, stainless steel, machine bolts shall be furnished and installed along with two (2) Owner-furnished, 5/8-inch stainless steel, “tamper-proof” bolts.

B. Concrete and Grout

1. Concrete for manhole frame and cover adjustments in roadways shall be a rapid-setting, early strength mix meeting the requirements of Section 934-Rapid Setting Patching Materials for Portland Cement Concrete of the Georgia Department of Transportation’s Standard Specifications and utilizing a product from the Georgia Department of Transportation’s Qualified Products List 27, “Rapid Setting Patching Materials” (latest edition) such as CTS Manufacturing Company’s Rapid Set D.O.T. Cement or approved equal. Sand, coarse

aggregate, water, and other special additives shall be furnished and accurately proportioned in accordance with the patching material manufacturer's specifications.

2. Sand-cement grout for setting precast concrete adjustment rings shall consist of 1 part Type III Portland cement, 2 parts sand, with a maximum of 4.5 gallons of water per sack (cubic foot) of cement.

3. Hydraulic cement for use in sealing manhole joints, lift holes, around pipe connections, inverts, complete interior grouting of brick manholes, etc. shall be Thoro Waterplug (Masterseal 590), Quikrete Hydraulic Water-Stop Cement (No. 1126) or approved equal.

C. An acrylic curing and sealing compound shall be applied to the concrete surface in accordance with the manufacturer's instruction. The compound shall be Rez-Seal by Euclid Chemical Company or approved equal.

D. The perimeter joint shall have a cold-pour, liquid, crack sealant applied to inhibit the effects of water penetration between the newly placed concrete and the surrounding pavement. This application shall be in accordance with the manufacturer's instruction. The sealant shall be Brewer Cote of the Brewer Company, or approved equal.

E. Reinforcing steel shall be deformed, billet-steel bars conforming to ASTM A615, Grade 60. Bars shall be shop fabricated and bent cold.

F. Precast Concrete manhole sections shall conform to Specification for Precast Concrete Manhole Sections, ASTM designation C478, except as otherwise specified below. The method of construction shall conform to the drawings and details and the following additional requirements:

1. Barrel sections shall have tongue and groove joints. Joints shall have a round rubber gasket set in specially provided indentations. The round rubber "O"-ring gasket shall conform to ASTM C443 standard specifications SS-S-210A "Sealing Compound, Preformed Plastic fro Pipe Joints", Type I, Rope Form and AASHTO Designation M-198 75 1, Type B, Flexible Plastic Gasket (Bitumen) are also acceptable.

2. Type I cement shall be used except as otherwise approved.

3. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section. Each section of the manhole must be inspected and stamped by an accredited testing laboratory.

4. Sections shall be cured by an approved method for at least 28 days.

5. Top sections shall be eccentric except that precast concrete slabs shall be used where cover over the top of the pipe is less than 4 feet for all manholes.

6. Precast concrete slabs over top sections, where required, shall be capable of supporting the overburden plus live load equivalent to AASHTO H-20 loading.

7. Manhole steps shall be cast into precast sections and shall conform to ASTM Specification C478. Steps shall be Plastic Step by M.A. Industries, Inc. or equal.

8. Lift holes for handling the precast sections shall not penetrate completely through the wall.

G. Precast concrete adjustment rings shall conform to ASTM C478, except as otherwise specified below. The method of construction shall conform to the drawings and detail and the following additional requirements:

1. The precast concrete adjustment ring shall only be used for minor vertical adjustments (12-inches or less) to a manhole frame and cover out of pavement and where directed by the Owner.

2. The precast concrete adjustment ring shall be free from cracks, voids, and other defects.

3. The inside diameter of the precast concrete adjustment ring shall have a diameter to match the manhole frame and cover.

PART 3 - EXECUTION

3.01 GENERAL

A. Care shall be taken in all aspects of the work, including, but not limited to the following:

1. Protection of existing sanitary sewer mains and manholes.

2. Protection of existing adjacent utilities.

3. Protection of existing adjacent trees, shrubs, landscape, etc.

4. Protection of existing adjacent roadway surfaces.

5. Protection of existing adjacent drainage ways, creeks, streams, ponds, and lakes.

6. Handling of materials.

7. Providing traffic control.

B. The Contractor shall be effectively equipped with machinery, tools, materials, traffic control devices, etc. to perform the necessary tasks for completing work in accordance with these specifications and detail drawings.

C. The Contractor shall be effectively staffed with knowledgeable, capable personnel. Experienced, trained supervisory personnel shall be present at all times to ensure the best quality work in accordance with these specifications and detail drawings.

D. The Contractor shall legally dispose of all waste, surplus, or unsuitable materials or debris on a daily basis. Debris allowed to drop into sewer manholes shall immediately be removed to avoid the potential of sewer blockages. Contractor will be held responsible for any fine levied by Federal, State, or Local authorities having jurisdiction, which may be the direct or indirect result of work performed under this Contract.

E. In the event the Contractor encounters a manhole which has not previously been adjusted in accordance with the Specifications of this Contract, the Contractor shall inform the Owner. At the Owner's direction, the Contractor will correct the existing condition to bring the manhole to the current standards set forth by this Contract.

3.02 ADJUSTMENT AND/ OR REPLACEMENT IN ROADWAYS AND PAVEMENT

A. The adjustment to grade and/ or replacement of manhole frames and covers in roadways shall be performed with the following guidelines:

1. Accurately locate the Manhole (if not currently visible) and its center.

2. Mechanically core or saw-cut the full depth of existing roadway pavement around the manhole. A circular core/cut with a diameter sufficient for adjustment needs is required.

    a. Exceptions to this include situations in which existing, square concrete pad/patch, exposed at roadway surface is being replaced. In these instances the replacement pad/patch is to match the existing square dimensions.

3. All existing adjustment rings, bricks, shims, etc. shall be removed and the surrounding sub-base and base shall be excavated to the clean lines and dimension of the pavement core/cut.

    a. For Manhole adjustments less than 24-inches- Excavation shall be to a depth of 3-inches (minimum) below the resulting top of the intact manhole structure. The existing structure shall be exposed and be cleaned of residual dirt, mud, cement, gravel, etc. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, shall immediately be removed by the Contractor at no additional cost to the Owner.

b. For manhole adjustments greater than 24-inches- Excavation shall be to a depth of 3-inches (minimum) below existing cone section, the existing cone section removed, 1-foot concrete riser section(s) installed, the existing cone section reinstalled (if suitable for reuse), and all joints sealed & grouted. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, shall immediately be removed by the Contractor at no additional cost to the Owner.

4. The cast iron manhole frame shall be supported in place, centered accurately over the manhole throat/chimney, and set to the elevation and slope of the adjacent roadway surface. This support and the formwork for subsequent concrete placement around the installation shall be by a proven method deemed acceptable by the owner. The manhole throat/chimney diameter shall not be permanently compromised or constricted in any way. The use of manhole adjusting rings (of any type of material) or brick is not acceptable. Any supporting interior form/liner to remain in place shall be of a corrosion-resistant material, such as Vylon, PVC, HDPE, etc. and shall be secured and sealed in place with a proven, compatible adhesive/ sealant.

5. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place the concrete along with the required reinforcing steel to the detailed clearances. Mechanically vibrate the concrete to achieve proper consolidation and the elimination of voids. The concrete collar shall be a monolithic placement, completely filling the core/cut opening and encapsulating the top of the manhole structure and manhole cast iron frame. Screed concrete surface flush with the adjacent roadway surface. Float and/or trowel to a consistent finish. Tool a perimeter joint to a depth of 1-1/2-inch and apply a light broom finish. Following the finishing, apply a curing and sealing compound to the concrete and a crack sealant to the perimeter joint in accordance with manufacturer's instructions.

6. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines. Curing duration will be validated by the Owner by random sampling and testing during the course of the contract.

7. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.

B. As specifically directed for coordination with select Department of Transportation roadway resurfacing projects, the Contractor shall lower existing manholes prior to major road surface milling operations. The following general guidelines shall apply:

1. Accurately locate the manhole (if not currently visible) and its center. Reference and record location for subsequent adjustment.

2. Mechanically core or saw cut the full depth of existing roadway around the manhole, or completely remove the concrete pad/patch if such exists.

3. Dependent upon the anticipated depth of proposed road surface milling

   a. Remove the manhole frame and cover.

   b. Remove any existing manhole adjustments, i.e. adjustment rings, bricks, shims, etc.

   c. For manhole adjustments greater than 24-inches- The existing cone section is to be removed, 1-foot precast concrete riser section(s) shall be installed, the existing cone section (if suitable) shall be reinstalled, and all joints sealed and grouted. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, it shall be immediately removed by the Contractor at no additional cost to the Owner.

   d. If the proposed milling depth allows, the manhole frame and cover may be reset. If not, the manhole frame and cover shall be removed and an adequate sized steel traffic plate placed over the manhole structure. Either method is temporary until roadway milling and resurfacing has been completed, and shall be sufficient to support traffic loads as well as to protect the sanitary sewer facility.

   e. All debris, including the manhole frame and cover (if removed) shall be removed from the site.

4. Backfill with select granular material and compact to a level of 3-inches below the anticipated road surface milling depth.

5. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place concrete and screed to a level flush with the existing roadway surface. Neither concrete curing compound nor joint sealant will be required for this temporary pad/patch.

6. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines, curing duration will be validated by the Owner by random sampling and testing during the course of the contract.

7. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.

8. Following completion of the Department of Transportation's resurfacing of the roadway, permanent adjustment to grade of the manhole frame and cover shall be performed in accordance with these specifications.

3.03 ADJUSTMENT AND/OR REPLACEMENT OUT OF PAVEMENT

A. The adjustment to grade and/or replacement of manhole frames and covers out of pavement within right-of ways and/or easements shall be performed in accordance with the following guidelines:

1. Accurately locate the Manhole (if not currently visible) and its center.

2. Excavate to fully expose the top of the manhole structure at a depth to effectively and safely perform the manhole adjustment work.

3. All existing adjustment rings, bricks, shims, etc. shall be removed. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, shall immediately be removed by the Contractor at no additional cost to the Owner.

4. Perform manhole adjustments using all new materials and components in accordance with manufacturer instructions, industry guidelines, and these specifications and detail drawings.

    a. Manhole adjustments involving only frame and cover replacement will be accomplished by attaching the new frame to the manhole structure with 4 each, ½-inch diameter, stainless steel anchor bolts (or threaded rods), installed in drilled holes with epoxy adhesive. Install a butyl rubber flexible sealant (Ram-Nek, Kent Seal, or equal) to provide a mastic seal between frame and structure.

    b. Manhole height adjustments involving the removal of the existing precast cone or flat-top section, installation of a new precast concrete riser section of the proper diameter and height, and resetting the existing cone or flat-top section (if acceptable for reuse). Anchor Straps shall be installed per the standard details

    c. If the existing manhole is of brick and mortar construction, the brick cone and walls shall be demolished/ removed to an adequate and structurally sound level (as determined by the Owner). A new precast concrete riser and cone or flat-top sections of the proper diameter and height shall be installed on the brick structure. An external concrete collar shall be placed to secure the precast concrete to the brick structure as indicated by contract standard details.

    d. For locations specifically authorized by the Owner for minor vertical adjustments (12-inches or less), precast concrete adjustment rings may be used to elevate the frame and cover. Adjustment rings, along with the frame, shall be secured to the manhole structure with 4 each, ½-inch stainless steel anchor bolts (or threaded rods) installed in drilled holes with epoxy adhesive. Grout shall be used to bond adjustment rings as well as to provide an exterior seal.

5. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.

3.04 FIELD QUALITY ASSURANCES

A. Owner shall field inspect all work performed before final acceptance and payment.

B. A written two-year warranty shall be provided for the replacement work.

C. Failures considered to be warranty repairs include concrete surface spalling, cracking of the concrete, separation of the manhole frame from the concrete, or other obvious defects. The Owner may require the concrete mix manufacturer's involvement in examination of failures and determination of modifications necessary to avoid future defective work.

D. Warranty repair consists of complete removal and replacement of the manhole frame in accordance with these adjustment specifications at no cost to the Owner. Critical failures that create a potential traffic hazard shall be rectified within 24 hours of notice, while less serious failures shall be addressed within 30 days of notice. The failure type shall be determined by the Owner.

END OF SECTION 02650

SECTION 02660 - VALVE BOX ADJUSTMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section addresses the adjustment to grade and/or replacement of valve box for both in-pavement and out-of-pavement situations

B. The Contractor shall be responsible for the following:

1. Furnishing all labor, equipment, and materials necessary to complete the work.

2. Compliance with Cobb County Department of Transportation and/or Georgia Department of Transportation guidelines for work zone establishment, traffic control, authorization to perform work within roadways and right-of-ways, material specifications, etc.

3. Compliance with Cobb County Community Development regulations in regards to erosion and sedimentation control.

4. Negotiations and obtaining (in writing) any necessary permission to enter private property to access work areas.

5. Protect or re-establish existing drainage ways or easements which may be impacted during work activities.

6. Repair of any valve boxes damaged as a result of work activities.

C. The Owner will provide maps of the water distribution systems (via electronic PDF format) and other location details based on the best information currently and readily available for the Contractor's use in establishing the general location of a valve box. The Contractor is responsible for further location efforts (electromagnetic devices, survey measurement/alignment, etc.) to properly identify the work order location.

D. Water supply for concrete mix preparation shall be from an authorized, metered source. Fire hydrant meter(s) are available for rental from the Cobb County Water System

1.02 WARRANTY

A. A written two-year warranty covering all workmanship and materials shall be provided by the Contractor for each adjustment from the date of the completion of the work order.

1.03 SUBMITTALS

A. Submit shop drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01300 (Submittals) of these Specifications.

B. Submit to owner the detailed mix design information (compressive strength, curing time, availability to introduce traffic loads, etc.) for the concrete

C. Submit a letter from the rapid-set cement manufacturer certifying that all products proposed for use in conjunction with the cement have been reviewed (including the dye/ staining agent, curing and sealing compound, and crack sealant) and have been determined to be compatible with the cement material when used as intended in this project.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials and products utilized in the execution of the work shall be in accordance with these Specifications and the subject to the inspection, testing, and approval of the Owner.

2.02 MATERIALS

A. Valve Box

1. Valve Box shall be approved standard cast iron adjustable with a minimum diameter of 5-1/4-inches. The casting shall be coated with coal-tar pitch varnish. The lid shall bear the word “WATER”, the letter “W”, or other applicable designation for sewer, reuse water, etc. The valve box shall be East Jordan Iron Works model 8550 or approved equal.

B. Concrete and Grout

1. Concrete for valve box adjustments in roadways shall be a rapid-setting, early strength mix meeting the requirements of section 934 - Rapid Setting Patching Materials for Portland Cement Concrete of the Georgia Department of Transportation Standard Specification and utilizing a product from the Georgia Department of Transportation’s Qualified Products List 27, “Rapid Setting Patching Materials” (latest edition) such as CTS Manufacturing Company’s Rapid Set D.O.T. Cement or approved equal. Sand, coarse aggregate, water, and other special additives shall be furnished and accurately proportioned in accordance with the patching material manufacturer’s specifications.

2. Sand-cement grout for filling of annular space between valve box and precast collar shall consist of 1 part Type III Portland cement, 2 parts sand, with a maximum of 4.5 gallons of water per sack (cubic foot) of cement.

C. An acrylic curing and sealing compound shall be applied to the concrete surface in accordance with the manufacturer's instruction. The compound shall be Rez-Seal by Euclid Chemical Company or approved equal.

D. The perimeter joint shall have a cold-pour liquid, crack sealant applied to inhibit the effects of water penetration between the newly placed concrete and the surrounding pavement. This application shall be in accordance with the manufacturer's instruction. The sealant shall be Brewer Cote of the Brewer Company, or approved equal.

E. Mesh reinforcement shall be electrically welded, cold-drawn, mild-steel, plain wire fabric conforming to ASTM A185. Wires shall be cold-drawn steel conforming to ASTM A82. Mesh reinforcement shall be supplied as flat sheets or mats.

F. Precast concrete valve collars may be used in unpaved areas instead of casting valve collar in place upon approval of the precast valve collar shop drawings. The precast collar can be square or circular in shape. The concrete shall be a minimum of 3000 psi design and a have minimum thickness of 4". The precast collar shall be a minimum 18-inch square or have a minimum diameter of 18".

PART 3 - EXECUTION

3.01 GENERAL

A. Care shall be taken in all aspects of the work, including, but not limited to the following:

1. Protection of existing water main and valves.
2. Protection of existing adjacent utilities.
3. Protection of existing adjacent trees, shrubs, landscape, etc.
4. Protection of existing adjacent roadway surfaces.
5. Protection of existing adjacent drainage ways, creeks, streams, ponds, and lakes.
6. Handling of materials.
7. Providing traffic control.

B. The Contractor shall be effectively equipped with machinery, tools, materials, traffic control devices, etc. to perform the necessary tasks for completing work in accordance with these specifications and detail drawings.

C. The Contractor shall be effectively staffed with knowledgeable, capable personnel. Experienced, trained supervisory personnel shall be present at all times to ensure the best quality work in accordance with these specifications and detail drawings.

D. In the event the Contractor encounters a valve box which has not previously been adjusted in accordance with the Specifications of this Contract, the Contractor shall inform the Owner. At the Owner's direction, the Contractor will correct the existing condition to bring the valve box to the current standards set forth by this Contract.

E. All water distribution system valves shall be exercised through their full range upon completion of valve box adjustment work. An accurate "count" of full turns to fully open and close the valve shall be recorded along with the original position (open, closed, partial) and provided to the Owner. The valve shall be returned to its original position.

F. The Contractor shall avoid allowing any debris from the work activities to enter the valve box. If such occurs, the Contractor shall immediately take action to remove debris.

3.02 ADJUSTMENT AND/ OR REPLACEMENT IN ROADWAYS AND PAVEMENT

A. The adjustment to grade and/ or replacement of valve boxes in roadways shall be performed with the following guidelines:

1. Accurately locate the valve box (if not currently visible) and its center.

2. Mechanically core or saw-cut the full depth of existing roadway pavement around the valve box. A circular core/cut with a diameter sufficient for adjustment (but not to exceed 20-inches) is required.

    a. Exceptions to this include situations in which existing, square concrete pad/patch, exposed at roadway surface is being replaced. In these instances the replacement pad/patch is to match the existing square dimensions.

3. Excavate as necessary around the existing valve box including removing it to clean debris from the box and valve nut and to center the box on the valve nut. No existing valve box shall be reused if cracked, otherwise damaged, or if found inappropriate for the location. The area of excavation shall be to the clean lines and dimensions of the pavement core/cut. Excavation below the nominal depth of the concrete collar shall be backfilled in lifts and compacted to 98% standard proctor using select materials.

4. The valve box shall be supported in place, centered accurately over the valve, and set to the elevation and slope of the adjacent roadway surface. This support and the formwork for subsequent concrete placement around the installation shall be by a proven method and deemed acceptable by the owner. The valve box shall be installed to ensure positive accessibility of the operating nut or extension stem (if required) of the valve.

5. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place the concrete along with the required reinforcing steel to the detailed clearances. Mechanically vibrate the concrete to achieve proper consolidation and the elimination of voids. The concrete collar shall be a monolithic placement, completely filling the core/cut opening and encapsulating the top 10-inches of the valve box. Screed concrete surface flush with the adjacent roadway surface. Float and/or trowel to a consistent finish. Tool a perimeter joint to a depth of 1-1/2-inch and apply a light broom finish. Following the finishing, apply a curing and sealing compound to the concrete and a crack sealant to the perimeter joint in accordance with manufacturer's.

6. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines. Curing duration will be validated by the Owner by random sampling and testing during the course of the contract.

7. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.

B. As specifically directed for coordination with select Department of Transportation roadway resurfacing projects, the Contractor shall prepare existing valve boxes prior to major road surface milling operations. The following general guideline shall apply:

1. Accurately locate the valve box (if not currently visible) and its center. Reference and record location for subsequent adjustment.

2. Expose the valve box as necessary and/or otherwise remove the valve box cover.

3. Pack the valve box with heavy paper or other suitable filler material to prevent milling residue from filling the valve box.

4. Following completion of the Department of Transportation resurfacing of the roadway, permanent adjustment to grade of the valve box shall be performed in accordance with these specifications. This work will typically include valve box clean-out and valve box replacement.

3.03 ADJUSTMENT AND/ OR REPLACEMENT OUT OF PAVEMENT

A. The adjustment to grade and/or replacement of valve boxes out of pavement shall be performed in accordance with the following guidelines:

1. Accurately locate the valve box (if not currently visible) and its center.

2. Excavate as necessary around the existing valve box including removing it to clean debris from the box and valve nut and to center the box on the valve nut. No existing valve box shall be reused if cracked, otherwise damaged, or if

found inappropriate for the location. The area of excavation shall be limited as much as practical. Excavation below the required depth of the concrete collar shall be backfilled in lifts and compacted to 98% standard proctor using select materials.

3. The valve box intended for installation shall be supported in place, centered accurately over the valve, and set to the elevation and slope of the adjacent ground. The valve box shall be installed to ensure positive accessibility of the operating nut or extension stem (if required) of the valve.

4. The final 4" shall be reserved for the valve collar:

   a. Installing the cast in place concrete valve collar. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place the concrete along with the required reinforcing mesh to the detailed clearances. The concrete shall be a monolithic placement encompassing the top 4-inches of the valve box. Screed concrete surface to be flush with the adjacent ground level. Float and/or trowel to a consistent finish and apply a light broom finish.

      i. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines. Curing duration will be validated by the Owner by random sampling and testing during the course of the contract.

      ii. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.

   b. Install approved precast concrete valve collar.

3.04 FIELD QUALITY ASSURANCE

A. Owner shall field inspect all work performed before final acceptance and payment.

B. A written two-year warranty shall be provided for the replacement work.

C. Failures considered to be warranty repairs include concrete surface spalling, cracking of the concrete, separation of the valve box from the concrete, or other obvious defects. The Owner may require the concrete mix manufacturer's involvement in examination of failures and determination of modifications necessary to avoid future defective work

D. Warranty repair consists of complete removal and replacement of the valve box in accordance with these adjustment specifications at no cost to the Owner. Critical failures that create a potential traffic hazard shall be rectified within 24 hours of notice, while less serious failures shall be addressed within 30 days of notice. The failure type shall be determined by the Owner.

END OF SECTION 02660

SECTION 31 23 16
ROCK EXCAVATION

PART 1 GENERAL

1.01 SCOPE

A. Section includes drilling, blasting, splitting, disposal, and replacement of Rock.

B. Payment for Rock requires a field evaluation of the conditions encountered during the execution of the work, prior written approval of the Owner, and the use of surveying methods to determine quantities removed.

1.02 RELATED WORK

A. Section 01 72 10 - Preconstruction Surveys.

B. Section 31 70 05 - Blasting.

C. Section 31 23 33 - Trenching and Backfilling.

1.03 DEFINITIONS

A. Rock (General): Removal and disposal of rock material occurring as boulders or in beds, ledges, unstratified masses, and conglomerate deposits and which, in the opinion of the Owner, cannot be removed without the aid of systematic drilling and blasting or splitting. Drilling and splitting of rock material by mechanical or chemical means will be required and/or permitted in areas where the use of explosives is not allowed or not recommended because of sensitive surroundings. Drilling and blasting or splitting of difficult material in order to increase productivity will not be cause for identification of material as Rock.

B. Mass Rock: Any material occupying an original volume of more than one cubic yard which cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rating of not less than 80,000 pounds usable pull (for example, Caterpillar D-8 or larger).

C. Trench Rock: Any material occupying an original volume of more than one cubic yard which cannot be excavated with a backhoe having a bucket curling force of not less than 40,000 pounds, using a rock bucket and rock teeth (for example, John Deere 790 or larger).

1.04 SUBMITTALS

A. The Contractor shall submit to the Owner a complete list of major equipment to be used in the execution of the work, to include manufacturer's name, model number and year of manufacture. For excavating equipment, the Contractor shall also submit a copy of the manufacturer's printed

performance specifications for the equipment to be used. Information shall be submitted within 7 days after the issuance of the Notice to Proceed.

B. The Contractor shall submit, for approval by the Owner, a list of subcontractors to be used during any drilling and blasting or splitting operations.

C. If splitting by chemical methods is required and/or anticipated, the Contractor shall submit to the Owner the complete manufacturer's product data, including standard printed information concerning the proper use, storage and disposal of the material.

1.05 PROCEDURES

A. Notification: If, during the execution of the work, the Contractor encounters material believed to be classified as Rock, he shall immediately notify the Owner, provided however that a reasonable attempt has already been made to remove the material with excavating equipment equal to, and outfitted as, that hereinbefore specified. The Owner shall promptly investigate the conditions.

B. Classification: The Contractor shall demonstrate, in the presence of the Owner or the Owner's designated representative, that the material encountered cannot be removed with the properly outfitted specified equipment. Any claims for delay in the classification of the material that result from the Contractor's failure to have the proper equipment onsite will not be considered.

C. Inspections and Monitoring: Procedures outlined in Section 01 72 10 - Preconstruction Surveys, and Section 31 70 05 - Blasting, of these Specifications will be followed before any explosives are introduced to the site or any blasting is performed.

D. Measurement: Volume of material eligible for payment as Rock will be based on pre-surveys and post-surveys of the excavation. Surveys will be performed by the Owner, or the Owner's representative. The following methods will be used to determine payment quantities. The measurement method, or methods, used will be selected by the Owner depending on the specific blasting program employed by the Contractor.

1. Direct Measurement: This method involves the performance of a survey along the exposed top surface of the Rock after the removal of overburden material and after rock is excavated to the extents required for work.
2. Indirect Measurement: This method involves the determination of the unexposed top surface of the Rock by monitoring the drilling of test holes in the area to be excavated. Survey will be conducted along the ground surface and the depth to the Rock surface will be determined by the measurement of the drill shaft. Spacing of test holes will not exceed 50 feet. Implementation of this method will follow the classification of Rock in test pits excavated at reasonable intervals in the area of work.

As an alternate to drilling test holes, the depth measurements and horizontal locations may be made during the drilling of holes for blasting. Depth measurements will be confirmed by the Owner by inspection of exposed soil/rock interface following excavation of trench.

3. Volume Calculations: Survey data obtained by either aforementioned method will be used in conjunction with the certified record survey information of the line and grade of the finished work to determine the quantity of Rock removed. Limits of payment for trench excavation (trench width and bedding depth below pipe invert) will be based on the standard dimensions as detailed on the contract drawings, and the resulting rock quantity need not be measured. No allowances will be made for Rock beyond the specified payment limits for additional excavation for working space, pump sumps, drainage ditches or other like purposes.

E. Restoration: The Contractor shall restore or replace utilities, equipment, buildings, or structures damaged by blasting operations at no cost to the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 BLASTING

A. Blasting operations shall be conducted in full compliance with all laws of the State, local ordinances, and with all possible care. The Contractor shall adhere to the requirements of Section 31 70 05 - Blasting, of these specifications.

3.02 SPLITTING

A. Splitting of Rock by either mechanical or chemical methods shall be allowed and/or required as an alternate to blasting in areas considered too sensitive for the use of explosives. These areas shall be identified by the Owner or the blasting consultant before the initiation of the blasting program.

B. If chemical products are used for splitting of Rock, the Contractor shall perform the splitting operations in conformance with the manufacturer's printed instructions.

C. No additional compensation shall be allowed for mechanical or chemical splitting of rock where required or allowed in lieu of blasting.

3.03 DISPOSAL AND REPLACEMENT OF ROCK

A. Use excavated rock in backfilling trenches above pipe envelope subject to the following limitations:

1. Do not use pieces of rock larger than 3 inches.

2. Do not allow rock quantities used in backfill in any location to result in the formation of voids.
3. Do not place rock backfill within 16 inches of surface of finish grade or within 2 feet of the top of the pipe.
4. Specified density of compacted backfill must be attainable.
5. Do not use any rock in backfill under roadways and other paved areas.

B. Rock disposed of shall be replaced by available surplus excavation. Approved borrow to supply any deficiency of trench backfill shall be provided by the Contractor for no additional compensation. Material shall conform to requirements "Satisfactory Backfill Material" as described in Section 31 23 33 - Trenching and Backfilling, of these specifications.

C. If rock below required grade elevation is shattered by blasting, the shattered rock shall be removed and the excavation refilled with appropriate material at the expense of the Contractor.

D. If the excavated rock is considered by the Owner as acceptable material for the stabilization of slopes, creek banks, and channels, rock may be used in locations where riprap is called for on the Drawings. This use will be considered as disposal of the excavated rock and no payment will be made for riprap.

E. All surplus or unsuitable excavated rock shall be legally disposed of offsite by the Contractor.

END OF SECTION

SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparation.
2. Utilities Trenching.
3. Backfilling.
4. Compacting.

1.02 RELATED WORK

A. Section 01 11 00 - Summary of Work.

B. Section 31 70 05 - Blasting.

C. Section 31 25 00 - Erosion and Sedimentation Controls.

D. Section 01 57 23 - NPDES Storm Water Discharges.

1.03 SUBMITTALS

A. Test Reports: Testing laboratory will submit the reports directly to the Owner and shall copy the Contractor.

B. Results of sheeting and shoring analysis and design shall be submitted to the Owner.

1.04 QUALITY ASSURANCE

A. An independent geotechnical consultant will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications. The Contractor shall provide such assistance as necessary for sampling and testing. Cost of services of the geotechnical consultant will be paid for by the Owner under a separate contract or from the Geotechnical Allowance in the Bid Schedule.

B. Excavation and trenching activities must be performed in accordance with all applicable Federal, state, and local safety requirements, and all permits and certifications required by Cobb County Code must be obtained by the Contractor from the Cobb County Community Development Department prior to the execution of the work. Contractor must obtain Cobb County Trenching and Excavation Permit from the Cobb County Community Development Department. Copies of obtained permits along with copies of specific jobsite key personnel “Competent Person” and “Excavation and Trenching” certifications shall be submitted to the Owner.

1.05 SITE CONDITIONS

A. Traffic: Do not interfere with or close public or private roadways or driveways without permission of governing authorities. Work within the right-of-way of public roadways shall be done in accordance with requirements and provisions of the permits issued by the agencies for the construction within their respective rights-of-way.

B. Site Utilities:

1. Advise utility companies of all excavation activities before starting excavations. Locate and identify underground utilities passing through work area before starting work. Contact the Utilities Protection Center at 800-282-7411 and comply with “Call before you dig” requirements.
2. If underground utilities are encountered in locations other than indicated, immediately advise utility owners and the Owner before proceeding. Amend project record documents to show actual locations of all existing utilities encountered, regardless of whether or not shown on Contract Drawings.
3. Protect existing utilities.
4. Do not interrupt existing utilities without advance notice to and written approval from the utility owner.

C. If materials are encountered that are suspected of being hazardous or toxic, the Contractor shall follow the procedures specified in Section 01 11 00.

PART 2 PRODUCTS

2.01 MATERIALS

A. Obtain approval of each soil material from the Owner’s geotechnical consultant prior to use.

B. Satisfactory Topsoil: Fertile agricultural soil, typical for local conditions, capable of sustaining vigorous plant growth; free of subsoil, rocks, clay, toxic matter, plants, weeds, roots, or other undesirable material harmful or unnecessary for grading, planting, and maintenance.

C. Satisfactory Backfill Material: Fine, sound, loose, low plasticity soil (Plasticity Index less than 30). Material shall be free from all wood, vegetable matter, debris, and other objectionable material. If the backfill material has scattered clods, stones, or broken concrete, the maximum particle size shall be less than 3 inches in maximum dimension. When the backfill is used under roadways or other paved areas, the maximum particle size shall be less than 2inches. When the backfill is used with PVC or other flexible thermoplastic pipe, the maximum particle size shall be less than 3/4 inch.

D. Bedding Material and Stabilization Stone: Gravel, air-cooled blast furnace slag, crushed stone, or synthetic aggregate meeting the requirements of Section 800 of the State of Georgia Department of Transportation Standard Specifications for the Construction of Roads and Bridges, latest edition. Gradation shall be Size No. 57.

E. Where existing excavated materials are deemed unsuitable for backfill, obtain satisfactory borrow materials from other acceptable sources. Contractor shall be compensated for this replacement material in accordance with the Contract's Unsuitable Trench Backfill Allowance.

F. If otherwise suitable excavated material is compromised by the Contractor's failure to provide proper dewatering measures, to prevent surface water run-off into the excavated area, or to protect stockpiles of stored material, the removal of the compromised material and replacement with satisfactory borrow material will be accomplished by the Contractor at no cost to the Owner.

PART 3 EXECUTION

3.01 PREPARATION

A. Protection: Provide markers indicating limits of work and clear identification of items and areas requiring protection.

B. Provide barricades, warning signs, and warning lights around open excavations as necessary to prevent injury to persons.

C. The Contractor is solely responsible for determining the potential for injury to persons and damage to property. As well as the executing the work to prevent injury and damage.

D. Do not allow excavation subgrades and soil to be subjected to freezing temperatures, frost, or excessive water.

3.02 EROSION CONTROL

A. Provide erosion control during the entire project in accordance with the drawings and with the requirements of Section 31 25 00 - Erosion and Sedimentation Controls, and Section 01 57 23 - NPDES Storm Water Discharges, (as applicable) of these Specifications.

3.03 PROTECTION OF TREES

A. Provide temporary guards to protect the tops, trunks, and roots of trees as well as vegetation to remain in place. Protective guards or fencing shall be installed before work is started and shall be removed when directed by the Owner. Heavy equipment or the stockpiling of material will not be permitted within the branch spread drip line of protected trees.

B. Promptly repair any damaged trees to prevent death or loss of tree health. Repairs shall be performed in conformance with accepted horticultural practices suited to the nature and extent of damage done. The Contractor shall coordinate with the County's arborist to determine best practices for damage mitigation.

C. The Cobb County arborist will determine if additional measures are required to protect specific trees. The Contractor shall comply with the arborist's directions, at no additional cost to the Owner.

3.04 DEWATERING

A. Do not allow surface or groundwater to flow into or accumulate in excavations. All excavation shall be done "in-the-dry", defined as no more than ±3 percent of the soil’s optimum moisture content.

B. Do not allow water to flow in an uncontrolled fashion across the Project Site, to erode slopes, or to undermine excavations.

C. Provide and maintain temporary diversion ditches, dikes, and grading as necessary. When required by surface or subsurface water conditions, provide sumps, wellpoints, French drains, pumps, and other control measures necessary to keep excavations free of water. Do not use ditches and sumps as primary means of dewatering.

D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with stabilization stone at no cost to the Owner.

E. Water shall be disposed of in such a manner as not to be a menace to the public health and in accordance with applicable local regulations and State Environmental Protection Division standards and permits.

3.05 EXCAVATION

A. General: Excavation includes the removal of any materials necessary to achieve the required subgrade elevations and includes the reuse or disposal of such materials.

B. Unnecessary Excavation: Expense of excavation of materials outside of limits indicated shall be borne by the Contractor.

C. Approval of Subgrade: The adequacy of the subgrade shall be subject to the inspection and approval of the Owner before the installation of the pipeline.

D. Excavation Stabilization: Design, provide, maintain, and remove shoring and bracing in compliance with requirements of governing authorities. The Owner has the right (but not the duty) to require additional stabilization measures if the Contractor fails to comply with applicable requirements (such as, Contractor has not fully removed unsuitable materials, completed dewatering). The Contractor shall immediately comply with the Owner's directives, at no additional cost to the Owner.

E. Excavation for Utilities Structures: Excavate to allow proper construction and inspection of concrete formwork and other materials.

F. Excavation for Footings and Foundations: Remove any loose or sloughed material and adjust excavations to form a suitable bearing surface. Prior to

concrete placement, the excavations shall be inspected for proper grades, slopes, and compaction. Care should be taken to keep surface and groundwater out of the excavation prior to placement of concrete.

G. Excavation for Trenches:

1. Dig trenches to uniform widths and depths as indicated.
2. Trench walls for piping shall be vertical from trench bottom to 1 foot above top of pipe or to top elevation of initial backfill, whichever is higher.
3. Should hard, unyielding material be encountered when excavating for utilities bearing directly on trench bottom remove such material to at least 6 inches below required grade and replace with approved bedding material.

H. Unsuitable Excavated Soils and Subgrade: Where unsuitable materials are encountered within or below the excavation limits, they shall be removed and disposed of to the level or limits of suitable material. Areas so excavated shall be backfilled with satisfactory soil material and/or stabilization stone. Payment for this additional material will be from the corresponding allowance items listed in the bid form and with proper authorization and approval of the Owner.

1. If the limit of unsuitable materials extends beyond reasonable distance within the proposed trench excavation, the Contractor shall consider alternative stabilization measures (such as, 57 stone wrapped in geotextile fabric). Any alternative measures must be approved by the Engineer and Owner/Owner’s representative.

I. Explosives: The Contractor shall assume sole responsibility for the effects of explosives. Comply with the requirements of Section 31 70 05 - Blasting, of these Specifications.

J. Progress of Work: Length of trench to be opened or the areas of the surface to be disturbed or un-restored at any one time shall be limited by the Owner with regard both to expeditious construction and to the convenience and comfort of the persons residing in the neighborhood or frequenting the project area. New trenching will not be permitted when earlier trenches need backfilling or labor is needed to restore the surfaces to a safe and proper condition. Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying, and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. All trenches must be closed at the end of each workday.

3.06 STORAGE

A. Stockpile materials to be used for filling and backfilling in a manner to protect from contamination. Erosion and sedimentation control measures shall be provided as required by the field conditions encountered at no additional cost to the Owner.

B. In the storing of excavated material which is to be used for backfill, the Contractor shall exercise care so as to avoid inconveniencing the public. If, in the opinion of the Owner it is necessary to remove or relocate this excavated material, the Contractor will be required to do so at no cost to the Owner.

3.07 BACKFILLING

A. Preparation: Backfill excavations as soon as practicable. Complete the following operations before backfilling:

1. Remove temporary shoring and bracing as the work progresses and when its use is no longer necessary.
2. Request any inspections or testing required in the open ditch.

B. Installation:

1. Place bedding material and install pipe in conformance with applicable sections of these specifications and with the details on the Drawings.
2. Place approved soil materials in layers to required elevations.

3.08 COMPACTION

A. Place backfill in layers not exceeding loose depths as follows:

1. Heavy Equipment Compaction: 8 inches.
2. Hand Operated Tampers: 4 inches.

B. In-Place Density Requirements: Compact soil to not less than the standard proctor values given below.

1. Unpaved areas outside of roadway right-of-ways: 90 percent for all lifts.
2. Unpaved Areas of Roadway Right-of-Way: 98 percent for all lifts.
3. Paved Areas: 98 percent for lifts up to the top 12 inches, 100 percent for the top 12 inches.

C. Moisture Control: During compaction, control moisture of subgrades and subsequent lifts to within ±3 percent of optimum moisture content.

3.09 GRADING

A. Finish subgrades to following tolerance:

1. Unpaved Areas: Plus or minus 0.10 foot.
2. Sidewalk Areas: Plus or minus 0.05 foot.
3. All other Paved Areas: Plus or minus 0.05 foot.

B. Slope grades to prevent ponding.

C. Restore disturbed wetlands areas to original pre-construction configuration. The Contractor shall oblige to all relevant permits for the reestablishment of the wetland.

D. Dispose of excess soil in upland areas.

3.10 FIELD QUALITY CONTROL

A. Testing Laboratory Services: Provide timely notice to testing laboratory. Do not proceed with construction until testing, inspection, and approval have been obtained.

B. Maximum Density at Optimum Moisture Content: Determined in accordance with ASTM D1557, Method D.

C. In-Place Density Tests: ASTM D1556 (sand cone method), ASTM D2167 (rubber balloon method), or ASTM D2922 (nuclear method), as applicable.

D. If testing indicates that subgrade or fills are below specified density, scarify, or remove and replace to the required depth, re-compact, and retest at no additional cost to the Owner.

E. The cost of the initial tests will be borne by Owner. The cost of any retests or additional tests will be borne by Contractor.

3.11 MAINTENANCE

A. Completed Areas: Protect from damage by pedestrian or vehicular traffic, freezing, erosion, and contamination with foreign materials.

B. Damaged Areas: Where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction, whether due to subsequent construction operations or weather conditions, restore materials to required condition. Scarify or remove and replace to the required depth, return to optimum moisture content, and compact materials to the required density before continuing construction. Restoration of damaged areas will be accomplished at no additional cost to the Owner.

3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Evenly spread any excess satisfactory topsoil in locations on site as directed by the Owner. Properly dispose of unsatisfactory topsoil offsite.

B. Remove any trash, debris, and other materials not required for use on the project and legally dispose of it offsite.

C. Onsite burning or burying of any material is prohibited.

END OF SECTION

SECTION 31 70 05
BLASTING

PART 1 GENERAL

1.01 SCOPE

A. This Section covers the work necessary for the use of explosives and blasting for rock excavation.

B. This section includes requirements for blast design, blast limitations, explosive materials, equipment, labor, and supervision for use of explosives, drilling and charging of blast holes, protection of existing facilities, test blasts, and repair of damage due to Contractor's blasting operations.

1.02 DEFINITIONS

A. Air-Overpressure: Temporary changes in ambient air pressure caused by blasting. Air-overpressure is expressed in units of psi or linear scale decibels dB(L).

B. Blaster: Person qualified to be in charge of and responsible for the loading and firing of an explosive or explosive material.

C. Blaster-in-Charge: Blaster who is in charge of and responsible for the design, loading and firing of a blast, and has authority over decisions involving safe handling, use and site storage of explosives.

D. Buffer Holes: Holes with reduced energy charges drilled adjacent to smoothwall, trim or open line-drilled holes at the perimeter of the excavation. The explosive charge in buffer holes is generally between 50 percent and 75 percent of the charge used in normal production blastholes. Buffer holes are usually drilled parallel to adjacent holes at the excavation perimeter.

E. Charge-per-Delay (W): For purposes of vibration control, any charges firing within any 8-millisecond time period are considered to have a cumulative effect on vibration and air-overpressure effects. Therefore, the maximum charge-per-delay equals the sum of the weight of all charges firing within any 8-millisecond time period. For example, if two 10-pound charges fire at 100 milliseconds and one 15-pound charge fires at 105 milliseconds, the maximum charge per delay would be 35 pounds. The timeframe for separated charges can be reduced to 4 milliseconds if electronic detonators are used.

F. Controlled Blasting: Excavation in rock in which the various elements of the blast, including hole size, position, alignment, depth, spacing, burden, charge size, distribution and delay sequence are carefully controlled to excavate the rock to the desired lines with a relatively uniform surface with minimal overbreak and fracturing of rock beyond the design excavation limits and to

maintain resulting noise, overpressure and peak particle velocity within specified maximum limits.

G. Delay: Distinct pause of pre-determined time between detonations of single charges or groups of charges.

H. Line Drilling: A method of controlling overbreak in which a series of closely spaced uncharged holes are drilled at the perimeter of the excavation.

I. Occupied Building: Structure on or off construction limits that is occupied by humans or livestock.

J. Peak Particle Velocity (PPV): The maximum of the three ground vibration velocities measured in the vertical, longitudinal and transverse directions. Velocity units are expressed in inches per second (ips).

K. Primary Initiation: The method whereby the blaster initiates the blast(s) from a remote and safe location. Primary initiation systems use pneumatic tubing or shock-tubes to convey firing energy from blasters to blast locations.

L. Production Holes: Blast holes in the main body of the rock mass being removed by drilling and blasting.

M. Prohibited Persons: Persons prohibited from handling or possessing explosive materials as defined by the seven categories described in Section 555.11 of 27 CFR - ATF Rules.

N. Residential Building: Includes single and multi-family dwellings, hotels, motels, and any other structure containing sleeping quarters.

O. Scaled Distance: A factor describing relative vibration energy based on distance and charge-per-delay. For ground vibration control and prediction purposes, Scaled Distance (Ds) is obtained by dividing the distance of concern (D) by the square root of the charge-per-delay (W) - $Ds=D/(W)^{½}$.

P. Smoothwall Blasting (Trim Blasting): Controlled blasting technique used to produce smooth walls in a shaft or tunnel. The trim holes are located around the perimeter of the excavation but not along the tunnel floor or on sidewalls up to 3 feet above the tunnel floor. Trim charges are decoupled to reduce the linear charge density and are placed in holes with reduced spacing and are fired after production holes.

Q. Stemming: Crushed stone, tamped clay or other inert earth material placed in the unloaded collar area of blastholes for the purpose of confining explosive charges and limiting rock movement and air overpressure.

R. Subdrilling: Portion of blasthole that is drilled below or beyond the desired excavation depth or limit. Subdrilling is generally required to prevent the occurrence of high or tight areas of unfractured rock between blastholes.

1.03 REFERENCED STANDARDS

A. U.S. Department of Justice, Alcohol, Tobacco and Firearms and Explosives Division (ATF27 CFR Part 555, Implementation of the Safe Explosives Act, Title XI, Subtitle C of Public Law 107-296; Interim Final Rule).

B. Institute of Makers of Explosives (IME):

1. SLP-2 American Table of Distances
2. Glossary of Commercial Explosives Industry Terms

C. NFPA 495 - Code for the Manufacture, Transportation, Storage and Use of Explosive Materials

D. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Construction Standards and Interpretations 29 CFR Part 1926, Subpart U, Section 1926.900, “Blasting and Use of Explosives”.

E. ISEE - Field Practice Guidelines for Blasting Seismographs.

1.04 QUALITY CONTROL

A. Design and execution of blasting shall be performed under the on-site supervision of a Blaster-in-Charge licensed in the State of Georgia and meeting the experience requirements included herein.

B. Methods of construction shall be such as to ensure the safety of the Work, Project participants, the public, third parties, and adjacent property, whether public or private. The Contractor is solely responsible for maintaining safe working conditions at the jobsite at all times.

C. Perform blast monitoring as required by these specifications and as required to satisfy permit requirements, applicable federal, state, and local regulations, and contractual responsibilities, including safety.

D. The Owner may perform blast monitoring to verify conformance with air-overpressure (noise) and peak particle velocity criteria defined herein.

E. Worker Qualifications and Clearance Status:

1. Blasters-in-Charge shall be properly qualified and licensed in accordance with applicable federal, state, and local government regulations and have a minimum of 5 years of experience, directly related to the specific types of blasting they will oversee. Blasters-in Charge shall have completed and be able to document at least three projects of similar scope and complexity.
2. Blasters and supervising shift foremen shall be properly qualified and licensed in accordance with applicable federal, state and local regulations.
3. All persons that handle explosive materials, have control over them, or access to them, must not be prohibited persons, as defined in Section 555.11 of 27 CFR (ATF Rules).

1.05 SUBMITTALS

A. Permits: Submit a copy of all applicable permits and licenses for transportation, day-storage, and use of explosives prior to the start of blasting operations. Submitted permits must include a copy of Federal ATF blasting license listing all responsible persons, blasting use and storage permits issued by the local and state authorities; and a copy of the explosive supplier's Hazardous Materials Transport license. No explosives can be brought to any work sites until all necessary permits have been submitted.

B. Regulations: Contractor shall obtain at least two copies of all applicable federal, state, and local codes, laws, regulations, and ordinances regarding the use of explosives. Maintain a copy onsite in the Contractor's office, for review by all Contractor personnel involved in blasting.

C. Contractor Qualifications and Evidence of Experience: Provide resumes for proposed Blasters-in-Charge to show that the personnel meet the experience requirements. Resumes shall contain a chronological list of project experience, references with phone numbers, and copies of required blasting licenses.

D. Conceptual Blast Designs and Safety Measures: Provide blast designs and safety measures for all blasts. Submit the following information for initial test blasts and proposed production blasts for each excavation as appropriate:

1. Number, location, diameter, depth, and orientation of drill holes on a scaled drawing of the excavation.
2. Type of explosive and weight of charge in each hole.
3. Type and nomenclature of detonators.
4. Type and distribution of stemming used to fill hole collars for charge confinement.
5. Total amount of explosives in the blast and maximum charge-per-delay.
6. Delay arrangement showing delay period in each hole.
7. Description of the proposed blasting system; and type of firing source.
8. Description of measures used to check for misfires and means for clearing misfires.
9. Specific measures taken to protect structures, buried utilities and other facilities that may be potentially affected by blasting operations.
10. Detailed description and construction drawings of matting that will be used to contain fly rock and reduce air-overpressure.
11. Description of and locations of signage used to announce blast warning signals to any persons that might enter blast areas.
12. Clearing, guarding and communication procedures to confirm that all persons are evacuated to safe areas and that blast areas are secured prior to blasting.
13. Prediction calculations for noise (air-overpressure) and peak particle velocity (PPV) at the closest structure and at other adjacent structures, pipelines or facilities that may be potentially affected by blasting operations.
14. Powder factor calculations.
15. Redesign of any blasting program.

E. Blasting and Monitoring Records: Maintain a record of each blast detonated. Submit the following records and information the same day the blasting is performed:

1. Depth of blast holes and the location of the blast point in relation to Project stationing.
2. Type, strength and quantities of all explosives, types and quantities of detonators, powder factor (lb/cy), and actual firing times of all charges.
3. Total explosive loadings per round and maximum charge per delay.
4. Type of rock blasted.
5. Reference to approved blast design submittal noting any modification.
6. On a diagram of the approved blast pattern indicate holes not drilled, holes drilled but not loaded, changes in spacing or in pattern of delay charges or in loading of holes. Include notes explaining why changes were made.
7. Evaluation of the blast indicating tights, areas of significant overbreak and any recommended adjustments for future blasts.
8. Comments by the Blaster-in-Charge regarding any misfires, unusual results, or unusual effects.
9. Date and exact firing time of blast; name of person in responsible charge of loading and firing and blaster permit number.
10. Signature and title of person making recording entries.
11. Printed records of PPV and air-overpressure readings in 8-1/2-inch by 11-inch format including blast vibration monitoring and air-overpressure data consisting of at least peak measurements, frequency of motion at peaks, and 4-channel waveforms for each blast.
12. Any other records required by federal, state, and local codes, laws, regulations, and ordinances.

F. Blasting Safety and Security Plans:

1. Provide a complete description of the clearing and guarding procedures that will be employed to ensure personnel, staff, visitors, and all other persons are at safe locations during blasting. Include details regarding visible warning signs or flags, audible warning signals, method of determining blast area zones, access blocking methods, guard placement and guard release procedures, primary initiation method, and the system by which the Blaster-in-Charge will communicate with site security guards.
2. Provide detailed description of how explosives will be safely stored, transported, and used at the various work sites. Plans shall explain how storage magazines and explosive transport vehicles will satisfy all applicable regulations. This plan shall also indicate how explosives will be inventoried, secured, and guarded to prevent theft or unauthorized use of explosives.
3. If local and state agencies have authorized overnight storage of the explosives, submit a detailed storage plan that includes scaled maps indicating proposed location of detonators and explosives that will be stored overnight, distances to nearest occupied buildings, roadways, and other limiting items in the American Table of Distances (IME).
4. Include Safety Data Sheets (SDS) and specific details about hazard communication programs for employees.

5. Equipment that will be used to monitor the approach of lightning storms and in the event of such, evacuation and site safety security plans.
6. Contingency plans for handling of misfires caused by cut-offs or other causes.
7. Fire prevention plan details, including smoking policies, procedures and limitations for work involving any open flames or sparks, description and location of all firefighting equipment, and firefighting and evacuation plans.
8. Initial and ongoing blasting and fire safety training programs.
9. Description of the personal protective equipment that will be used.
10. Description of blast monitoring equipment and listing of individuals that will operate such equipment. Submittal shall indicate that all equipment meets the standards defined in this Section. Submit calibration certificates for each blast monitoring unit as described in this Section.
11. Include copies of ATF Employee Possessor questionnaire forms (OMB No. 1140-0072) or ATF evidence of clearance for all employees that will possess explosives for this work as defined in 27 CFR Part 555.

G. Submit preconstruction inspections prior to the start of blasting at any location as required by the Contract Documents.

H. Minimum requirements for Notification of blasting are included in the following paragraphs. Provide additional notification as required by local and state codes, laws, regulations, and ordinances:

1. Prior to starting blasting at work sites, notify the appropriate local municipal officials, aboveground and belowground utility owners, and the Owner who will notify the general public expected to be potentially affected, of the Contractor's intent to conduct controlled blasting operations. Notice shall be given to operators of buried pipes, cables, conduits and overhead utility lines and poles located within a 200-foot radial distance of the blast area.
2. Notification to appropriate local municipal officials and utility owners or operators shall be done in writing, at least 48 hours prior to the start of blasting at a site or sooner if required by state or local law or regulation. The notification shall indicate the expected frequency of blasting, hours that blasting might occur and the expected date that blasting will be completed. Upon completion of blasting at the particular site, utility owners or operators shall be notified that blasting has ceased in the area for the duration of the Project.
3. The Contractor shall furnish the Owner with a list of those parties notified prior to the start of such blasting and a copy of the notification letters sent. The list shall include names, addresses and telephone numbers.
4. Submit copies of written notification letters sent to the responsible fire protection agency for any sites where explosives are stored overnight. These letters shall be submitted to the Owner at least 48 hours before any explosives are stored at the site. These letters must be submitted by the Contractor to the responsible fire protection agency 48 hours before explosives are stored at the site, or earlier if required by regulations or permit requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver explosives to magazines by land transportation in accordance with applicable federal, state, and local codes, laws, regulations, and ordinances.

B. Storage of Explosives:

1. Transportation, use and storage of explosives shall be as prescribed by the most stringent of the rules promulgated by federal, state, and local codes, laws, regulations and ordinances, and these Specifications.
2. Initiation devices shall not be stored, transported, or kept in the same place in which other explosives are stored, transported, or kept.
3. Day boxes used to transport explosives and detonators to blast sites shall conform to OSHA rules regarding construction and labeling.
4. Records shall be maintained that clearly show quantities and types of all explosive materials and detonators received from suppliers and returned to them. The differences in received and returned quantities must accurately correspond with the amounts reported in blasting records.
5. All explosive materials must be attended by the Blaster-in-Charge or another trained and ATF-cleared worker while on site.
6. No statement in these Specifications shall be considered to relieve the Contractor from sole responsibility for the safe transportation, use and storage of explosives.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only explosive and initiation devices packaged by federally licensed explosives manufacturing firms.

B. Explosives and blasting agents used underground shall meet the Fume Class I requirement of the Institute of Makers of Explosives (IME). This restriction does not apply to detonation cords that may be used for trunk lines or in controlled perimeter blasting charges.

C. Use only packaged or cartridge type, non-flowing explosives. Use of ammonium nitrate and fuel oil (ANFO) and pumped emulsion are prohibited for all blasting.

D. Non-electric detonating devices or electronic initiators shall be used. The use of conventional electric detonators and cap-and-fuse are prohibited.

E. Use only explosives designed and manufactured for smoothwall (trim) blasting in perimeter holes.

F. Keep explosives, blasting agents, primers, initiators, and ancillary blasting materials in original packaging with clearly marked date codes. All explosives and initiating devices used shall be less than 1 year old.

G. Products found to be damaged or in a deteriorated condition shall be immediately returned to the supplier for safe disposal.

2.02 BLAST MONITORING EQUIPMENT

A. Provide and operate a minimum of two (2) blast vibration and air pressure monitoring units. Equipment for onsite and offsite particle velocity and air overpressure monitoring shall be four-channel (one overpressure and three seismic channels) units capable of digitally storing collected data. Equipment must be capable of producing digital ground motion time histories and summaries of peak motion intensities, frequencies and USBM RI8507 PPV frequency plots. Digital report records must include date, time of recording, operator name, instrument number and date of last calibration.

B. Monitoring instruments shall meet the following requirements:

1. Flat frequency response between 2 Hz and 250 Hz for particle velocity and from 2 to 200 Hz for air-overpressure. Do not use A-weight or C-weight microphones for air-overpressure monitoring.
2. Digitizing sampling rate for peak particle velocity and air overpressure measurements of at least 1,024 samples per second.
3. Capable of performing a self-test of velocity transducers and printed event records shall indicate whether or not the sensor test was successful.
4. Capable of recording overpressure from 100 to 148 dB(L), and particle velocity from 0.05 to 5.0 inches/second.
5. Capable of providing digital event reports that include all peak measurements, frequencies, and complete waveform plots.
6. Have adequate memory to digitally record the entire duration of the blast-induced motion.
7. Seismograph/software systems shall be capable of saving back-up copies of all event files.
8. Monitoring equipment shall have been calibrated by the manufacturer within 12 months of the time of use. The blast monitoring units shall be calibrated at least once per year or more frequent if recommended by the manufacturer and if a unit is damaged.

2.03 PRECONSTRUCTION SURVEYS

A. Complete a preconstruction survey in accordance with the requirements of the Contract Documents prior to the commencement of any blasting operations.

PART 3 EXECUTION

3.01 GENERAL BLASTING LIMITATIONS

A. Perform blasting in accordance with applicable regulations and ordinances for construction, including work hours and noise limits.

B. Blasting vibration and air-over pressure limitations are defined below.

3.02 WARNING SYSTEM

A. Erect signboards of adequate size stating that blasting operations are taking place in the area. The signs shall be clearly visible at all points of access to the area. These signs shall also clearly display the audible warning signals (horn signals) that will be used to warn all people in the area of the impending blast.

B. An audible blast warning system shall be established, publicized, and operated only during blasting hours.

3.03 BLASTING OPERATIONS

A. Notify the Owner at least 24 hours before each blast.

B. Provide the Owner with a schedule for all blasts and notify the Owner if any blast is delayed for more than 1 hour. The Contractor is allowed to re-shoot missed holes and tights, as they are uncovered, without advance notice to the Owner.

C. Holes shall not be charged with explosives at the same time that drilling or other mechanized equipment not needed to charge the round is being operated within 50 feet of the blast area.

D. Changes in drilling and delay patterns and amount of explosives shall be made when results indicate vibrations and/or air-overpressures in excess of that specified herein. Submit any major changes in the production blast design to the Owner.

E. Place a blasting mat cover over the excavation prior to blasting to contain flyrock and to reduce air-overpressure. Other covers may be proposed, subject to Owner review and acceptance.

F. For tunneling operations, utilize shaft covers constructed with steel frames covered with wood planking that has a minimum thickness of 2.5 inches or covered with heavy expanded metal. Attach overlapping conveyor belt skirts to the sides of the shaft cover to close openings between the shaft collar and cover. Install additional sound reducing materials on the shaft cover if needed to meet the specified air-overpressure limit.

G. Anchor shaft covers to prevent the cover from being dislodged during blasting.

H. After blasting underground, provide sufficient fresh air ventilation to ensure measured levels of toxic fumes do not exceed threshold limit values before any personnel are allowed to enter affected underground areas.

I. After a blast is fired, loose and shattered rock or other loose material, which may endanger the structure or the workers, shall be removed and the excavation made safe before proceeding with work.

J. Before drilling blast holes for a new round, scale, clean and examine the face for missed holes and unexploded charges. All located misfires must be remediated before any other work occurs.

K. Removal of loose or shattered rock or other loose material that may enlarge the excavation beyond the required limits shall not relieve the Contractor of responsibility for such removal and subsequent additional backfill. The Contractor shall not be entitled to additional payment for overexcavation or backfill.

L. No blasting is allowed within 40 feet of freshly placed concrete or grouted rock until 12 hours has elapsed since placement. Shotcrete is exempt.

M. Stop blasting operations immediately upon the approach of an electrical storm and evacuate personnel from the blasting area to a place of safety. Explosive materials at partially charged blasts shall be left in place and guards shall be placed to restrict access to the blast areas. During such electrical storms, explosives on the surface shall be left in OSHA-approved transport containers, DOT-compliant delivery vehicles, and day-storage boxes or in approved storage magazines. At all times, explosives shall be guarded and secured by the Contractor's AFT-cleared personnel positioned in safe locations.

N. Disconnect and/or remove light and power circuits to a point not less than 100 feet from the face while explosives are being transported into the area and while the loading operations are taking place. Use only OSHA approved lighting during the hole charging loading operations.

3.04 AIR-OVERPRESSURE LIMITS

A. Air-overpressure shall not exceed 130 dB(L) at any occupied structure. Air-overpressure monitoring shall take place at the nearest residential or business structures susceptible to damage or claims of annoyance.

B. Measurements of blast-induced air-overpressure shall be done in accordance with ISEE - Field Practice Guidelines for Blasting Seismographs.

3.05 VIBRATION LIMITS AND CONTROLS

A. The Charge-per-delay in all blasts shall be sized in conformance with the minimum scaled distance and not-to-exceed PPV limits shown in Table 3.5.A. The most restrictive scaled distance limitation shall be used at all locations.

Table 3.5.A – PPV and Scaled Distance Limitations

Location	PPV (in/s)	Minimum Scaled Distance ($ft/lb^{1/2}$)
Residential Buildings	0.5	60
Industrial Buildings	1.0	40
Railroad Tracks	2.0	30

Table 3.5.A – PPV and Scaled Distance Limitations		
Location	**PPV (in/s)**	**Minimum Scaled Distance ($ft/lb^{1/2}$)**
Buried Pipes and Utilities	4.0	15

B. The Contractor shall deploy at least two seismographs to measure blast induced vibration and air-overpressure. Unless otherwise indicated by the Owner, monitoring shall be done at the two nearest occupied structures, the nearest utility of concern, and the nearest plant building.

C. Measurements of blast-induced ground motion shall be performed in accordance with ISEE - Field Practice Guidelines for Blasting Seismographs.

3.06 SUSPENSION OF BLASTING

A. Blasting operations may be suspended by the Owner for any of the following reasons:

1. Failure of the Contractor to adhere to the submitted and accepted blast plan.
2. Air overpressure or ground motion levels exceed specified limits.
3. Conditions of existing structures located either onsite or offsite are damaged by blasting.
4. Blasting causes instability of slopes.

B. Blasting operations shall not resume until the Owner has approved the Contractor's revised blasting plan with modifications correcting the conditions causing the suspension.

3.07 DAMAGE REPAIR

A. If blasting operations damage properties, plant facilities, or a portion of the work or material surrounding or supporting the work, promptly repair or replace damaged items to the condition that existed prior to the damage, to the satisfaction of the Owner.

END OF SECTION

SECTION 33 05 06
WATER LINES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, equipment, materials, and incidentals necessary to install and test all water supply piping and appurtenances as specified.

1.02 RELATED WORK

A. Section 01 33 00 - Submittals.

B. Section 01 78 23 - Operating and Maintenance Data.

C. Section 31 23 33 - Trenching and Backfilling.

1.03 SUBMITTALS

A. Submit Shop Drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01 33 00 - Submittals, of these specifications.

B. Submit operating and maintenance information for valves and hydrants furnished under this section to the Owner in conformance with the requirements of Section 01 78 23 - Operating and Maintenance Data, of these specifications.

1.04 INSPECTION

A. All materials to be installed under this contract may be inspected by the Owner at the site of manufacture for compliance with these Specifications.

1.05 DESIGN CRITERIA

A. Reference Standards of the American National Standards Institute (ANSI), the American Society of Testing of Materials (ASTM), and the American Waterworks Association (AWWA).

1. ANSI / AWWA C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast.
2. ANSI / AWWA C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
3. ANSI / AWWA C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
4. ANSI / AWWA C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. ANSI / AWWA C110/A21.10, Standard for Gray-Iron and Ductile-Iron Fittings, 3” through 48” Inches for Water and Other Liquids.

6. ANSI / AWWA C104/A21.4, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
7. ANSI / AWWA C600 Standard for Installation of Ductile-Iron Mains and Their Appurtenances.
8. AWWA M41, Ductile Iron Pipe and Fittings.
9. ANSI / AWWA C509, Standard for Resilient-Seated Gate Valves for Water-Supply Service.
10. ANSI / AWWA C502, Standard for Dry-Barrel Fire Hydrants.
11. ANSI / AWWA C651, Standard for Disinfecting Water Mains.
12. ANSI / AWWA C800, Standard for Underground Service Line Valves and Fittings.
13. ASTM B88, Standard Specification for Seamless Copper Water Tube.
14. MSS SP-80, Standard Practice for Bronze Gate, Globe, Angle, and Check Valves.

B. All materials, testing, and incidentals referenced by the Standards and Specifications mentioned herein are to conform to the latest revisions.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall be of standard design for which the manufacturer recommends the service is intended in accordance with AWWA or ASTM Standard Specifications.

B. All pipe and appurtenances shall be of the type and size shown in the Contract Documents and all materials of the same type shall be from one manufacturer.

C. Pipe materials shall be as follows:

1. Mains, ductile iron.
2. Service lines, copper.

2.02 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall meet the following requirements and be as specified hereinafter.

1. Ductile iron pipe shall be of the centrifugally cast type, either in metal or cast molds, and shall conform to ANSI A21.51 or AWWA C151. Ductile iron shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi, pressure rated at a minimum of 350 psi and have a minimal wall thickness of 0.25-inch unless field conditions determine that a heavier wall thickness is required. The pressure rating and manufacture date shall be shown on each piece. Pipe shall be furnished in industry standard lengths, complete with all necessary glands, joint material, including rubber gaskets, lubricant, bolts and nuts. Pipe furnished shall be as manufactured by U.S. Pipe and Foundry; American Cast Iron Pipe; or equal.

2. All ductile iron pipe used for below-grade service in the project shall have push-on joints and shall meet the requirements of ANSI A21.11 or AWWA C111, latest revisions. Ductile iron pipe used in the project for above-ground service or in below-ground vaults shall have flanged joints conforming to the requirements of ANSI A21.15, latest revision.

B. Fittings:

1. All pipe fittings shall be ductile iron and shall be of a standard design for use with the pipe purchased under these specifications. Fittings shall conform to the following applicable specification.
   a. Mechanical Joint fittings: Fittings shall be ductile iron compact fittings conforming to ANSI A21.53. The rubber gasket joints shall conform to ANSI A21.11. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.
   b. Flanged Fittings: Shall conform to ANSI A21.10 and shall have flanges faced and drilled in conformance with ANSI Standard A21.15. Joints shall be installed with full ring rubber gasket that shall conform to ANSI A21.11. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.

C. Pipe and fittings shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI A21.4 and be coated on the exterior with a 1.0 mil thick bituminous coat in accordance with ANSI A21.51, unless substituted for an alternative exterior coating as shown in the contract drawings. A ceramic lining shall be substituted for the cement mortar lining where shown in the Contract drawings. Linings shall meet NSF 61 requirements for potable water service.

D. Polyethylene Encasement: Where indicated in the Contract Documents, the Contractor shall provide a double layer of polyethylene encasement over pipe, fittings and valves when installed near steel natural gas pipelines. The material, installation and workmanship shall conform to applicable sections of ANSI Standard A21.5. Installation shall be employed using flat tube polyethylene.

E. Restrained Joints:

1. Sections of ductile iron piping (including fittings) designated in the Contract Documents as having restrained joints shall be constructed using pipe and fittings equal to those listed below:
   a. U.S. Pipe and Foundry Company: TR FLEX.
   b. McWane Ductile: TR FLEX.
   c. American Ductile Iron Pipe Company: LOK FAST or LOK RING.
2. Restrained joint pipe sections where specifically noted shall utilize basic push-on joints with special gaskets equal to:
   a. U.S. Pipe and Foundry Company: FIELD LOK GASKET.
   b. McWane Ductile: SURE STOP 350® GASKET.
   c. American Ductile Iron Pipe Company: FAST-GRIP GASKET.
3. Wedge action retainer glands where specifically noted or directed shall be used in conjunction with other conventional thrust restraint devices (rodding, thrust blocking, thrust collars) and shall be equal to:

a. EBAA Iron Megalug.
b. Ford Uni-Flange Series 1400.
c. U.S. Pipe and Foundry M.J. Field Lok Gasket.

2.03 COPPER PIPE

A. All copper pipe shall conform to Federal Specifications WW-T-799, Type "K" as a minimum with plain ends. Fittings and connections for pipe sizes of 1-inch and less shall be of the flared type. Pipe sizes greater than 1-inch shall have compression fittings and connections.

2.04 COPPER TUBING

A. All copper tubing shall conform to ASTM Designation B88 for the Type "K" Soft Temper and AWWA 7S-CR Type "K" copper. Fittings and connections for pipe sizes of 1-inch and less shall be of the flared type. Pipe sizes greater than 1-inch shall have compression fittings and connections.

2.05 GATE VALVES

A. All valves 3 inches to 12 inches in diameter shall be iron-body resilient-seated gate valves with non-rising stems conforming to the requirements of AWWA C509, rated for a design working pressure of 200 psig. Valves 16 and 20 inches shall have a design working pressure of 150 psig. Sizes smaller than three inches shall meet MSS SP-80. Gate valves shall be as manufactured by Dresser, Mueller, American-Darling, Clow, Kennedy, Walworth, American AVK, or similar approved equal.

B. All gate valves shall have mechanical joint ends meeting ANSI A21.11, be equipped with a 2-inch square operating nut and open counterclockwise.

C. Valve stem extensions shall be provided and installed for all valves 5 feet or greater in depth (operating nut depth). Reference 2.09, Valve Boxes, below for specifics.

2.06 AIR/VACUUM RELEASE VALVES

A. Valves shall have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser and Buna-N seat with threaded fittings. Valves shall be manufactured by GA Industries, APCO Valve and Primer Corporation or equal.

2.07 CORPORATION STOPS

A. Corporation stops shall be all “No-lead” brass suitable for 200 psi operating pressure and similar to A.Y. McDonald 74701B, Ford FB600, or approved equal.

2.08 VALVE BOXES, VALVE ASSEMBLIES, VALVE PADS/MARKERS

A. Valve boxes shall be cast-iron two or three piece with cast iron covers. The barrel shall be one-piece or two-piece, screw type, having 5-1/4-inch shaft. Covers shall have "WATER" cast into the top.

B. Valves which have operating nut at depths greater than 5 feet or valves specifically designated by the drawings or Special Conditions shall be composed of a valve box and extension stem. All moving parts of the extension stem shall be enclosed in the valve box housing to prevent contact with the soil. Valve box and extension assembly shall be adjustable to accommodate variable trench depths. A debris cap or seal shall be integral to the assembly to prevent debris and silt from entering the barrel of the valve box.

1. The stem material shall be of plated steel square tubing. The stem assembly shall have a built-in device that keeps the stem assembly from disengaging at its full extension length or from the valve nut. Valve box / extension assembly shall incorporate American Flow Control's *Trench Adapter*, Ametek's Roadway Valve Box with Integral Key, or equal.

C. Concrete valve pads/collars are required for all valve boxes that are not located in a paved area. Concrete valve markers shall be furnished and installed on existing roads where shown in the Contract Drawings.

2.09 FLEXIBLE COUPLINGS

A. Flexible couplings shall be Catalog No. 411 as manufactured by Smith-Blair, Style No. 38 and 40 as manufactured by Dresser Utility Solutions, or approved equal.

2.10 FIRE HYDRANTS

A. Fire hydrants shall conform to AWWA C502 for dry-barrel fire hydrants. Hydrants shall be traffic type with safety flange which allows the valve to remain closed when the hydrant is broken or damaged above or near grade level. The design of hydrant shall be of the compression type with main valves and "O" ring seal between the operating nut and the bonnet. Hydrant color shall be silver.

B. Hydrant inlet shall be 6-inch, mechanical joint with harnessing lugs. Hydrant main valve opening shall be 5-1/4-inch. Valve seats shall be bronze to bronze.

C. Operating nut shall be solid pentagon, 1-1/2 inches measured flat at point (31/32 on side). Operating nut shall turn counterclockwise to open.

D. Hydrant shall have two 2-1/2-inch diameter and one 4-1/2-inch diameter nozzle. Nozzles threads shall be the standard adopted by NBFU. Nozzles shall all have gasketed caps fitted with chain.

E. The hydrants shall be as follows:

1. Mueller Co.; Model Super Centurion 250.
2. U. S. Pipe Valve & Hydrant, LLC; Model Metropolitan M-94.
3. M & H Valve Company; Model:129.

2.11 CURB STOPS

A. Curb stops shall be of “No-lead” brass construction with tee handle operator. Curb stops shall be A.Y. McDonald 76102W, Ford B21, or approved equal.

2.12 TAPPING SLEEVES

A. Tapping sleeves shall be full-bodied mechanical joint Class 250 pipe for 200 psi cold water working pressure. Sleeves shall be either American Flow Control Series 2800C, Mueller #H-615, or approved equal.

2.13 TAPPING SADDLES

A. Double Strap Saddles: Saddles shall be either Smith Blair 313 Double Bale, Romac 202U or approved equal.

2.14 ADAPTERS AND UNIONS

A. Adapters for copper flare to female iron pipe thread shall be of “No-lead” brass construction and shall be A.Y. McDonald 74754, Ford C21, or approved equal.

B. Adapters for copper flare to male iron pipe thread shall be of “No-lead” brass construction and shall be A.Y. McDonald 74753, Ford C28, or approved equal.

C. Union shall be of “No-lead” brass construction and shall be A.Y. McDonald 74758, Ford C22.

PART 3 EXECUTION

3.01 GENERAL

A. Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or coatings. Pipe shall be protected during handling against impact shocks and free fall and shall be kept clean at all times. No forks, chains, straps, hooks shall be placed inside the pipe and/or fittings for lifting, positioning, or installing material. All pipe or fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Owner.

B. If any defective pipe is discovered after it has been installed it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall conform to the lines and grades required.

C. Contractor must have a set of the original Contract plans and specifications at all times on the job site. These shall be kept current by the Contractor in regards to field changes.

D. Unless specifically indicated otherwise, underground piping shall slope uniformly between joints.

E. Extreme care shall be used when constructing piping to protect all existing underground utilities, and all existing structures. Any damage to existing utilities or structures shall be repaired or replaced and restored equal to or better than pre-construction conditions at the contractor's expense.

F. For existing lines installed under other contracts, to which piping of this Contract must connect, the Contractor shall expose buried lines to confirm or determine pipe material and diameter, furnish, and install appropriate piping, and make proper connections.

G. Contractor shall inscribe (saw-cut) a "V" on the concrete curb or sidewalk in line with and adjacent to a water distribution valve/valve box location (if no witness mark currently exists and no valve marker is present or required).

3.02 INSTALLATION

A. Pipe and fittings shall be installed as shown on the Contract Drawings, and in accordance with requirements of AWWA Standard Specifications except as otherwise provided herein. A firm, even bearing throughout the length of the pipe shall be constructed by tamping selected material at the sides of the pipe up to the springline. Blocking supports will not be permitted. Bell holes shall be hand excavated to ensure uniform bearing along the pipe barrel. Pipe shall be installed with a minimum of 48 inches of cover or as otherwise stated in the Contract Documents.

B. Pipe shall be sound and clean before installing. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in installation. The deflection at joints shall not exceed 75 percent of that recommended by the manufacturer.

C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Contractor shall take care not to damage lining, if the lining is damaged, the contractor shall perform field repairs to the lining in accordance with manufacturer's requirements.

D. Push-on joints shall be installed in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends facing upstream, unless directed otherwise by the Engineer due to significant slopes. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined and pushed home with a jack or by other means, to the painted gauge line on the plain end to ensure it is properly

positioned in the bell socket. Hydraulic excavators, backhoes, or other machinery shall not be used to push slip-joint pipe together. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

E. Unless otherwise noted, underground ductile-iron piping shall be push-on with mechanical joint fittings, valves, fire hydrants.

F. The Contractor shall carefully regulate their equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall be replaced at the Contractor's expense.

G. Wet tap connections shall only be allowed on ductile iron water mains and with a smaller nominal size main connecting (tapped) to a larger main.

H. Authorized connections to water mains of the Cobb County – Marietta Water Authority require utilization of tapping sleeves / saddles approved by the Authority.

I. Unless otherwise noted, service lines 2 inches and smaller that are to be installed under paved roadways (long side services) are to be encased in the appropriate sized conduits as shown on the Contract Drawings.

3.03 PIPE SUPPORTS AND THRUST RESTRAINT

A. All piping shall be properly and adequately supported. Longitudinal thrust along pressurized pipelines at bends, tees, reducers, and caps or plugs shall be counteracted by enough weight of concrete to counterbalance the vertical and horizontal thrust forces.

B. Joints shall be protected by felt roofing paper prior to placing concrete thrust block. Bearing area of thrust blocks shall be adequate to prevent any movement of the fitting and shall be of the size and dimensions as shown on the Contract Drawings.

C. The dimensions and values for thrust block sizing is based on a water main test pressure of 350 psi, or the test pressure as shown on the Contract Drawings if it is exceeded by this requirement and a horizontal bearing strength of the soil of 2,000 psf. The bearing surface of the thrust block shall be placed against undisturbed soil, unless precluded by site conditions. In these cases, selected fill material shall be placed between the bearing surface and undisturbed soil and compacted to at least 95 percent Modified Proctor density to obtain the required bearing pressure.

D. Concrete for thrust blocking shall be 3,000 psi minimum. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts, or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.

E. Restrained joints shall be used as shown on the Contract Drawings. Thrust blocks shall be used at all other locations or as directed by the Owner.

F. Tie rods, where shown on the Contract Drawings to be used in conjunction with thrust restraint devices, shall be cold-rolled alloy steel rods with a minimum tensile strength of 125,000 psi and shall be coated with bitumastic paint after installation.

G. Wedge action retainer glands where shown on the Contract Drawings to be used in conjunction with thrust restraint devices, shall be installed in accordance with manufacturer's instructions.

3.04 CLEANING MAINS

A. At the conclusion of the Work and prior to pressure testing and disinfection, the Contractor shall thoroughly clean the new pipeline by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

B. Flushing of pipelines shall be performed in a manner to protect the environment as well as physical features from the impacts of the discharge of water. Hoses, diffusers, or other devices shall direct or dissipate pressure impacts to structures, ground surfaces, roadways. Dechlorination of discharge flow is mandatory prior to allowing it to enter any waterway or storm drainage network subsequently discharging into an active stream.

3.05 PRESSURE AND LEAKAGE TESTS OF UNDERGROUND PRESSURE PIPING

A. Hydrostatic pressure and leakage tests shall conform to Section 5 of AWWA C600. The Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the line. The pressure gauge used for testing shall be laboratory calibrated suitable for the test pressure required. The Contractor must submit their plan for testing to the Owner for review at least three days before starting the test.

B. The pressure required for the field hydrostatic pressure test shall be 150 percent of the maximum normal operating pressure of the test section (200 psi minimum), or the pressure class of the pipe, or the surge pressure of the section, whichever is greater as shown on the Contract Drawings. The Contractor shall provide temporary plugs and blocking necessary to maintain the required test pressure. Duration of pressure test shall be at least 2 hours.

C. The leakage test shall be a separate test at the maximum operating pressure as determined by the Owner following the pressure test and shall be of not less than 2 hours duration. All exposed pipes, fittings, valves, and joints will be carefully examined during the tests and all leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced. The pipelines shall be tested in such sections as may be directed by the Owner by shutting valves or installing temporary plugs as required. The line shall be filled with water and all air removed and the test pressure shall be maintained in the pipe for the entire test period by means of a force pump to be furnished by

the Contractor. Accurate means shall be provided for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage.

D. The amount of leakage, which will be permitted, shall be in accordance with AWWA C600 Standards for all pressure lines. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

in which "L" is the allowable leakage, in gallons per hour; "S" is the length of pipe tested, in feet; "D" is the nominal diameter of the pipe, in inches; and "P" is the average test pressure during the leakage test, in pounds per square inch gauge.

E. The Owner's Representative shall observe all pressure and leakage testing associated with the Contract work.

F. The Contractor shall remove and adequately dispose of all temporary blocking material and equipment after completion and acceptance of the field hydrostatic test, unless otherwise directed by the Owner. Any damage to the pipe coating shall be repaired by the Contractor.

3.06 DISINFECTION

A. Upon completion of the pressure and leakage test, the pipe shall be disinfected.

B. Disinfection shall be accomplished by the continuous feed chlorination method in accordance with AWWA C651. The following steps shall be employed:

1. Begin filling main at a constant, measured rate with potable water. As water first flows in, begin adding chlorine at a point no more than 10 feet from the beginning of the new main.
2. Add chlorine at a rate to attain a 25 mg/L chlorine concentration. The acceptable method is by preparing a 1 percent solution with sodium hypochlorite or calcium hypochlorite. The required amount of chlorine to produce a 25 mg/L concentration in 100 feet of pipe is as follows:

Pipe Dia. (in.)	100% Chlorine (lb)	1% Chlorine Solution (gal.)
4	0.013	0.16
6	0.030	0.36
8	0.054	0.65
10	0.085	1.02
12	0.120	1.44

Pipe Dia. (in.)	100% Chlorine (lb)	1% Chlorine Solution (gal.)
16	0.217	2.60
18	0.275	3.30
20	0.339	4.06
24	0.488	5.85

3. Continue adding chlorine at a rate to attain a minimum concentration of 25 mg/L. Measure the free chlorine concentration at regular intervals as given in AWWA M12 or with a high range test kit. Chlorine application shall continue until the entire main is filled.
4. The chlorinated water shall be retained in the water main for a minimum of 24 hours during which time valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of the 24-hour period the water in all portions of the main shall have a minimum chlorine residual of 10 mg/L. If the residual chlorine is below 10 mg/L, the disinfection process will be repeated by the Contractor at no cost to the Owner until satisfactory results are obtained.

C. Heavily chlorinated water shall be dechlorinated and flushed in a manner which is not detrimental to the environment. The method proposed shall be submitted to and approved by the Owner prior to discharge. Final flushing shall continue until the chlorine residual is less than 2 mg/L.

D. Contractor shall coordinate sampling with the Cobb County-Marietta Water Authority (CCMWA), following authorization by the Owner. No earlier than 16 hours after final flushing, the CCMWA will obtain bacteriological samples for testing using Option B as described in AWWA C651:

1. Before approving a main for release, let it sit for a minimum of 16 hours without any water use. Then collect, using the sampling site procedures outlined and without flushing the main, two sets of samples a minimum of 15 minutes apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release.

E. If bacteriological test results are unsatisfactory, the main shall either be flushed with potable water or re-disinfected by the Contractor, as directed by the Owner, prior to obtaining additional samples. Satisfactory bacteriological test results shall be obtained prior to placing the new main in service. The disinfection process will be repeated by the Contractor at no cost to the Owner until satisfactory results are obtained.

END OF SECTION

SECTION 33 05 07.23
AUGER BORING

PART 1 GENERAL

1.01 WORK INCLUDED

A. This Section presents requirements for construction of under-crossings with steel casings installed by auger boring, as shown on the Drawings. Furnish all labor, equipment, and materials necessary to complete the work. Auger boring may also be referred to as jacking and boring.

B. Stabilized excavations are required at each end of the auger bore to perform the work, referred to herein as pits. Construction of pits is incidental to auger bore construction.

C. Furnish and install carrier pipe in completed auger bores in accordance with this Section.

D. Furnish and place contact grout and backfill grout as required by this Section and as indicated on the Drawings.

1.02 METHOD OF CONSTRUCTION

A. Roadway crossings shall conform to the requirements of the state or local Department of Transportation having jurisdiction in the Project area.

B. Conduct work on Georgia DOT rights-of-way in conformance to Georgia DOT rules and regulations. Coordinate and schedule the work with the Cobb County DOT and/or Georgia DOT, as appropriate. Provide traffic protection as required by the governing authority.

C. Protect existing underground and overhead utility pipes, poles, lines, services, and structures from damage or interruption of service. Locate and protect all underground utilities and structures in the path of construction.

D. Railroad crossings shall conform to the requirements of the American Railway Engineering Association Manual for Railway Engineering. For railroad crossings:

1. Secure permission from the railroads to schedule the work and prevent interference with operation of the railroads.
2. Furnish the railroad with any additional insurance as may be required, together with the costs for flagmen, watchmen, temporary work of any nature, safety devices and any other items that may be imposed by the railroad. This cost is incidental to the work.
   Repair any damage due to construction to the satisfaction of the railroad at no additional cost to the Owner.

E. Any change in the construction method during the work or increase in length of bore beyond that specified due to a selected construction method shall not result in additional payments.

F. No payment will be made for incomplete or unacceptable casings and no extra payment will be made for realignment of casings.

1.03 PERFORMANCE REQUIREMENTS

A. Install casing so carrier pipe can be installed at line and grade shown on the Drawings. Installation tolerances shall be same as for open cuts unless stated otherwise on the Drawings.

B. Limit ground settlement to prevent disturbance and damage to adjacent pavement, utilities, structures, and other facilities. Ground surface settlement caused by boring shall not exceed 1/2 inch. Ground surface settlement caused by pit construction shall not exceed 1 inch, within 15 feet of each pit.

C. Protect adjacent structures and facilities from damage due to auger boring. If damage to adjacent pavement, utilities, structures, or facilities occurs, repair the damage to the satisfaction of the Owner of the damaged pavement, utility, structure, or facility.

1.04 QUALITY ASSURANCE

A. Retain a qualified surveyor to provide layout for the bores. Staff responsible for bore alignment and grade control shall have experience providing layout for comparable bores in the past three (3) years.

B. The Contractor shall furnish a supervisor responsible for oversight of auger boring meeting the following minimum experience requirements:

1. Completion of at least three (3) auger bores in the past three (3) years. Diameters and lengths of at least two (2) of the referenced auger bores shall be equal to or greater than those required for this Project.
2. At least one (1) referenced auger boring project shall have been completed in ground conditions similar to those anticipated.

C. Auger boring equipment operators shall be trained in the use of the proposed equipment. Experience shall include at least 500 LF of comparable boring.

D. Welders shall be experienced with welding for comparable steel casings and shall conform to the requirements of the AWS (American Welding Society) D1.1/D1.1M.

E. Casing pipe suppliers shall be regularly engaged in providing steel casing pipe conforming to the referenced standards for use in trenchless pipe installations.

F. Design and construct pits in accordance will all applicable regulations. If design by an Engineer is required, retain a qualified Shoring Engineer to evaluate requirements for stabilizing and shoring pits and shafts.

G. Shoring Engineer shall be a Professional Engineer licensed in Georgia with at least three (3) years of related design experience, including responsibility for at least two (2) comparable designs.

H. Shoring Engineer shall evaluate stability conditions and shall provide signed and sealed recommendations for the excavation configurations and stabilization measures and shall provide shoring designs including sealed drawings and design calculations.

1.05 SUBMITTALS

DELETE NOTE BELOW BEFORE FINALIZING SPECIFICATION

NOTE TO SPECIFICATION WRITER/ORGANISER: This section is intended to be adapted on a project-by-project basis. Submittals should be tailored based on the size, length and surroundings of the project. Contact the design engineer to discuss these submittals and what is suited to your project.

A. Provide auger boring submittals within 60 days of Notice to Proceed, and a minimum of 30 days prior to the scheduled start of the Work. Contractor may propose to submit the work plan as multiple separate submittals, subject to approval by the Owner. Provide a work plan for auger boring, including descriptions, Shop Drawings, sketches, and cut sheets, addressing the items listed below. Auger boring shall not commence until all required submittals have been reviewed and are accepted.

1. Provide the following for all projects, except as otherwise required by the Construction Manager:
    a. Site layout sketch showing equipment layout, power and water supply locations, traffic flows, pit locations, site access and egress, and existing utilities.
    b. General descriptions of equipment to be used.
    c. Work schedule.
2. Provide the following information for projects with casing diameters greater than 36 inches, and/or with lengths greater than 100 feet:
    a. Boring equipment, including manufacturer’s specifications and cut sheets. Include the make, model, and size.
    b. Bore guidance and steering systems, power system, lubrication pumps and lubrication distribution system.
    c. Track configuration and setup.
    d. Spoil handling methods.
    e. Augers, cutterheads, and track system or backstop to be used, if applicable.
    f. Descriptions of procedures and equipment to prevent over-excavation, control face stability, and achieve the settlement limits and to prevent voids from developing above the bore.
    g. Explanation of how the spoil volume removed will be evaluated and monitored.
    h. Boring head(s), including description of capability to bore the range of anticipated ground conditions along the alignment.
    i. Pipe jacking system, including cylinder sizes and jacking capacities, jacking frame and/or backstop configuration, thrust

ring configuration and dimensions, and power unit(s). Indicate location, type, and calibration of pressure monitoring devices and readouts, including pressure vs. load relationship for jacking cylinder gauges. Describe configuration of interfaces between casing pipes and jacking equipment, including the thrust ring or yoke, and bearing surfaces.

j. Boring procedures, including plans for monitoring and controlling jacking pressures to prevent exceeding allowable loads on the casing.

3. Methods to maintain face stability and prevent ground loss and erosion of fines when jacking is stopped.
4. Methods and procedures for line and grade control, as required to achieve the design line and grade within the specified tolerances. Address the following:
   a. Survey control and benchmarks for the pits and auger bore.
   b. Layout to setup the track and position casing in the launch pit.
   c. Measures and procedures for monitoring the lead casing position and grade and for adjusting during boring.
5. Groundwater and construction water control plan including drainage, pumping, treatment, and disposal of ground and construction water. Describe methods of drainage and water control in the bores and pits. Plans for storage and handling of casing and carrier pipe.

B. If the Contractor's Shoring Engineer determines that engineered shoring systems are required for pit construction, provide calculations and drawings sealed by the Shoring Engineer. Pit design shall include:

1. Shoring design calculations. Including a written summary of the basis of design, including all key assumptions, sources of information, and selected parameters for design.
2. Shoring design drawings.
3. Specifications for construction sequencing, shoring materials, and products.
4. If prefabricated shoring systems are used, such as trench boxes, provide a sealed statement from the shoring engineer confirming that the specified methods and products proposed are appropriate to satisfy the requirements of the design and applicable regulations.

C. Provide the following submittals prior to fabrication of the steel casing pipe:

1. Shop Drawings illustrating the dimensions of the casing pipe, joint details, any related elements to be furnished as part of the casing installation. Show dimensions, tolerances, wall thickness, properties and strengths, and other pertinent information.
2. Description of the steel casing materials and products, including steel grade and maximum allowable axial force.
3. Manufacturer's written certification that the steel casing conforms to the specified requirements.

D. Submit a carrier pipe installation work plan including narratives, Shop Drawings, sketches, and cut sheets. Include or address the following items:

1. Schematic profile along bore axis showing proposed layout for carrier pipe installation.
2. Description of survey and layout procedures, including as-built profile of the casing prior to installing carrier pipe.
3. Procedures for installation of carrier pipe, casing spacers, and pipe end blocking, as applicable. Describe plan for storage and handling of carrier pipe.
4. Details of proposed casing spacers and blacking materials, including:
    a. Section perpendicular to bore axis showing proposed casing spacers and blocking.
    b. Product descriptions, cut sheets, specifications, and Shop Drawings of the casing spacers and blacking materials provided by the manufacturer. Provide the manufacturers' recommended installation procedures including casing spacer intervals.
5. Plan for assembly of the casing spacers and carrier pipe and insertion into casing. Include anticipated maximum forces to be applied to carrier pipe and casing spacer assembly during insertion into casing.
6. If requested by the Construction Manager, and for all bores larger than 36 inches in diameter, provide a written statement verifying that the carrier pipe manufacturer has reviewed the proposed work plan for pipe installation and blocking and confirmed the plan is generally appropriate for the carrier pipe.

E. Provide a work schedule, identifying all major construction activities as independent items. Summarize construction sequence, number and duration of shifts planned and daily sequence of operations.

F. Submit construction reports, daily, during construction. Include:

1. Description of work performed, including specific stations bored.
2. Employees and general description of duties.
3. Equipment in use or on standby.
4. Volume of muck excavated per segment of casing.
5. Bore alignment and grade.
6. Description of ground encountered, and material excavated.
7. Meter readings for water provided to and discharged from pits.
8. Summaries of materials delivered and material certificates, if requested by the Owner for information.

G. Provide as-built records for the casing once the casing is installed.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Select, provide, operate, and maintain all equipment and utilities required to perform the work shown on the Drawings and specified in this Section, and suitable for the anticipated ground conditions.

B. Equip machinery with mufflers and/or noise suppressors.

C. Boring equipment shall incorporate means to monitor the elevation of the lead casing at least once per joint of casing.

D. Boring equipment shall incorporate means to steer the lead casing and/or boring head as necessary to meet the line and grade performance requirements specified in this Section.

E. Cutting heads, boring heads, and augers shall be configured to control the ingress of excavated ground and prevent over-excavation.

F. The equipment used shall not result in an overcut greater than 1/2 inch beyond the outside diameter of the casing.

G. Provide means to monitor the jacking pressure.

H. Jacking system shall develop a uniform distribution of jacking forces on the end of the casing pipe. Provide casing lubrication system as required to limit jacking pressure.

I. Provide sump pumps and discharge lines for each pit, with appropriate capacity as required to maintain pits in a dry condition.

J. For casing pipe installations exceeding 48-inch diameter, provide grouting equipment suitable for contract grouting the annulus.

2.02 MATERIALS

A. Store, protect, and handle all materials and products in accordance with recommendations of the manufacturer or supplier.

B. Wood lagging, blocking and wedges shall be hardwood.

C. Casing Pipe:

1. Provide steel casing pipe with the minimum dimensions shown on the Drawings.
2. Steel Casing Pipe shall be new carbon steel pipe, conforming to or exceeding the requirements of ASTM A139, Grade B (waive hydro), or ASTM A252, Grade 3. Casing shall have a minimum yield strength of 35,000 psi and shall conform to the material requirement for ASTM A36, Grade 2 (plate spec).
3. Contractor may elect to provide steel casing with an interlocking push joint in lieu of casing with welded joints. Casing with interlocking push joints suitable for auger boring. Casing with push joints shall conform to ASTM A515, Grade 60, or ASTM A572, Grade 42.

4. Steel casing pipe shall have a minimum wall thickness as indicated in the following table, unless otherwise stated elsewhere in the Contract Documents:

Nominal Diameter (inches)	Wall Thickness (inches)
Under 14	0.188
14	0.219
16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28	0.406
30	0.406
32	0.438
34	0.469
36	0.469
42	0.500
48	0.625
54	0.700

D. CARRIER PIPE

1. Carrier pipe size, material, and application (water supply, gravity sewer, sewage force main) shall be as indicated on the Drawings.

E. Casing Spacers:

1. Casing spacers shall be configured to position and restrain the carrier pipe within the casing.
2. Spacer spacing shall not exceed 10 feet on center.
3. Compatible with the carrier pipe and casing and proposed backfill placement. Prevent metal to metal contact.
4. Acceptable Manufacturers:
   a. Pipeline Seal Insulator Products, Inc.
   b. Cascade Waterworks Manufacturing Co.
   c. CCI Pipeline Systems.
   d. Power Seal.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Clearing shall be performed as required for completion of the work within the limits indicated on the Drawings.

B. Protect and preserve benchmarks, monuments, and reference points provided.

C. Prior to beginning work, locate and protect all existing overhead and underground utilities within 30 feet of the limits of each pit excavation and bore centerlines.

D. Obtain and provide all services required to perform the work, including electrical power, and water. The cost of utilities and services shall be incidental to the work.

E. If an adjacent road, structure, utility, or other facility is damaged due to the work, develop and implement a written work plan for repairing the damage and restoring the condition to the pre-construction condition, to the satisfaction of the Owner of the road, structure, utility, of facility.

3.02 PIT CONSTRUCTION

A. Control site and pit entry during construction. Provide and maintain barricades, fences, and other means as required to prevent unauthorized entry of personnel and vehicles into pit and work areas.

B. Grade the surface around the pits to prevent runoff into pits and onto adjoining property.

C. Operate and maintain sump pumps in each pit or shaft to maintain the operations in a dry condition.

D. Prevent trucks and other equipment from tracking dirt or debris onto roads. Immediately remove any dirt tracked onto roads near pits.

E. Maintain stability and prevent soil erosion in the pit sidewalls and bases.

F. Install all shoring tight against the ground to prevent voids from developing in the ground adjacent to the pits.

G. The maximum unsupported height of pits during excavation shall be determined by the contractor’s Shoring Engineer, but shall not exceed 5 feet, unless the ground is sloped back or pre-supported.

H. Remove all excavated material, debris, and equipment prior to pit backfilling.

I. Remove all shoring to a depth of 5 feet below the ground surface at each pit, unless otherwise approved by the Owner.

J. Backfill pits with flowable fill (CLSM) and/or compacted fill in accordance with the Specifications for trench backfill, and upon approval by the Owner.

3.03 AUGER BORING

A. Verify alignment and grade of the launch cradle, tracks, or other casing supports prior to starting jacking.

B. Perform construction layout required to construct the bores in accordance with the Work Plan and Specifications.

C. Install survey control as required to accurately lay out the installation for all casing installations meeting one or more of the following criteria:

1. Larger than 24 inches in diameter, gravity pipeline installations longer than 50 feet in length, and all installations crossing transportation or utility rights of way if required by permit or the Construction Manager.

D. Survey and record the position of the lead casing a minimum of two (2) times in the first 20 feet of the bore, and as necessary to achieve the design line and grade tolerances, for bores greater than 36 inches diameter. Contractor shall confirm surveying can be performed safely and perform surveying in accordance with OSHA and other applicable safety regulations.

E. Install soil anchors or other measures, as required to prevent the auger boring equipment from overturning during operation.

F. Inspect casing prior to lowering it into the launch pit to ensure that no cracked, broken, or otherwise defective materials are used.

G. Mark each casing joint with a painted number indicating order of installation.

H. Welded casing joints shall be complete penetration, single-bevel groove type joints. Pipe ends shall be tapered as required for welding. Clean the ends of all casing segments before joining.

I. Welding shall be performed in accordance with AWS D1.1/D1.1M. Weld casing joints to provide full capacity of the pipe against jacking and in-service loading conditions. Welds shall be airtight and continuous over the entire circumference and length of the steel casing pipe. Complete Permalok connections in accordance with the manufacturer’s recommendations.

J. Operate and control the boring head and/or lead casing position as required to maintain face stability and to prevent over-excavation and settlement, during jacking, and when jacking is temporarily stopped.

K. Water jetting shall not be used to excavate the bore.

L. Inject bentonite slurry into the overcut annulus if required to prevent excessive jacking loads.

M. In the event of a work stoppage, stabilize the face and jack the casing string periodically, as required to prevent pipe set and to prevent start-up jacking loads from exceeding allowable loads.

N. If the bore encounters an object or condition that prevents advancing the casing, immediately notify the Owner. If casing advance is halted, submit a plan to remove obstructions that impede advancement. Upon written notification by Owner, immediately proceed with obstruction removal.

O. Casing shall not be subjected to loads exceeding the capacity of the casing.

P. Install the casing as required to install the carrier pipe at the design line and grade, within the tolerances specified, and as shown on the Drawings.

Q. Monitor the auger bore line and grade and adjust the bore inclination during jacking of each casing pipe segment.

R. Notify the Owner of deviations from the design line, grade, dimensions, or tolerances immediately after occurrence. Provide the Owner with as-built survey of the affected section, and written plan to remedy the deviation, within 24 hours of occurrence.

S. Repair all casing damaged or deformed during installation, and replace all casing not installed to permit installation of the carrier pipe to the specified tolerances, at no additional cost to the Owner.

T. On completion of casing installation, clean the casing of all debris, and seal any leaks such that there is no dripping or flowing seepage into the casing.

U. Fill voids that developed during casing installation by means of contact grouting. For all casing larger than 48 inches diameter, contact grouting shall be performed.

V. Perform an as-built survey of the installed casing before installing the carrier pipe. Survey line and grade at the invert at the ends of the casing.

3.04 INSTALLATION OF CARRIER PIPE

A. Remove equipment and materials, and accumulated soil, debris, and wash water from the casing prior to carrier pipe installation.

B. Install carrier pipe within the completed bore at the design line and grade, following the work plan. Utilize a laser line to check and control the position of the carrier pipe, during installation. Adjust the carrier pipe position as necessary to achieve the design tolerances.

C. Install carrier pipe in casing utilizing adequate blocking, bracing and skids or casing spacers per the manufacturer's recommendations.

D. Prevent abrasion or damage to the carrier pipe during installation; lubricate all sliding surfaces prior to sliding casing spacers or carrier pipe. Prevent rotation of the carrier pipe during installation.

E. Remove any damaged pipe prior to placement of backfill.

F. Seal casing ends against entrance of foreign material by means of casing seals, grout, brick and mortar or steel plate.

G. When indicated in the Contract Documents, the annular space between the casing pipe and the carrier pipe shall be completely filled with an approved casing backfill grout mix. Proper precautions shall be taken to prevent floating and misalignment of the carrier pipe during grouting operations, if performed.

3.05 ACCEPTANCE CRITERIA

A. Installed carrier pipe shall be clean and free from debris.

B. Install carrier pipe at the design line and grade, within the tolerances specified in this Section.

C. Repair any damage to the carrier pipe at no additional cost to the Owner.

D. Pits are backfilled.

END OF SECTION

SECTION 33 05 13
PRECAST CONCRETE MANHOLES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all materials, labor, and equipment and construct manholes, as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit to the Owner Shop Drawings of the products specified herein. Shop Drawings of the precast structures shall show details of construction, reinforcing and joints.

B. Submit calculations signed by a Professional Engineer licensed in the state of Georgia demonstrating the structure meets the design criteria specified herein for manholes greater than 20 feet and any other manholes required by the Owner.

1.03 INSPECTION

A. Quality of materials, process of manufacture, and finished sections shall be subject to inspection and approval by the Owner.

B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. Imperfections may be repaired, subject to the approval of the Owner, after demonstration by the manufacturer that strong and permanent repairs result.

1.04 MANUFACTURER QUALIFICATIONS

A. Manufacturer shall be PCI certified plant with current certification.

B. Precast Concrete and Precast Prestressed Concrete: Product of manufacturer with 3 years’ experience producing precast concrete products of quality specified.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE MANHOLES

A. Precast concrete manhole base, barrel and eccentric top sections shall conform to Specifications for Precast Reinforced Concrete Manhole Sections, ASTM C478, except as otherwise specified below. The method of construction shall conform to the Drawings and the following additional requirements:

1. Barrel sections shall have tongue and groove joints. Joints shall have elastomeric gaskets conforming to ASTM C443 and ASTM C990 standard specifications. Should an external wrap joint be required, it shall be in accordance with ASTM C877 with a minimum thickness of 60 mils. External wrap joints shall be resistant to corrosion or rotting under wet or dry conditions, rated for use in gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide, and other trace gases at installation site.
2. Type I cement shall be used except as otherwise approved.
3. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section. Each section of the manhole must be inspected and stamped by an accredited testing laboratory.
4. Sections shall be cured by an approved method for at least 28 days.
5. Top sections shall be eccentric except that precast concrete slabs shall be used where cover over the top of the pipe is less than 4 feet for all manholes.
6. Precast concrete slabs over top section, where required, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.
7. Manholes steps shall be cast into the precast sections and shall conform to ASTM C478. Steps shall be Plastic Step by M.A. Industries, Inc., or equal.
8. Holes in precast sections to receive sewer pipe shall be precast at the factory at the required locations. All pipe seals shall be in accordance with ASTM C923, shall have a demonstrated history of providing watertight seal between pipe and manhole. All precast holes shall have compression or boot type seals.
9. Tops of bases shall be suitably shaped to mate with the precast barrel section.
10. All manholes, except those located in paved areas or where precise adjustment of top elevation is required, shall be furnished with the cover frame cast into the top section.

B. Cast Iron Frames and Covers:

1. Shall be ASTM A48/A48M Class.
2. Shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and defects.
3. Plane or grind bearing surfaces to ensure flat, true surfaces.
4. Cast or drilled holes for frame to structure anchor bolts.
5. Watertight frames and covers shall be molded from high quality rubber such as nitrile or EPDM and stainless steel bolts.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manholes and other precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications.

B. Precast concrete structure sections shall be set to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed.

C. If possible, holes in the concrete manhole sections required for handling or other purposes shall not penetrate completely through the wall. All lifting holes shall be plugged with a nonshrinking grout.

D. Where holes must be field cut in the precast sections to accommodate pipes, the holes shall be cored to provide a smooth sealing surface for connecting boots or compression seals. All coring shall be done prior to setting the manhole sections in place.

E. Manholes shall have an invert channel shaped to correspond with the lower half of the pipe. The top of the shelf shall be sloped to drain toward the flowing through channel.

F. Where adjustment or replacement of a manhole frame and cover is necessary, the following requirements shall apply:

1. Adjustment of frame and cover to grade shall be accomplished with a precast concrete and/or HDPE leveling rings, fully bedded in portland cement mortar. In no case shall vertical adjustment exceed 14 inches.
2. The top of the frame shall be set flush with, and match the slope of, the surrounding pavement.
3. Frame shall be set in a portland cement mortar bed (1-1/2 inch maximum thickness).
4. Exterior surface of rings used in leveling course area shall be coated with a portland cement plaster (1/2 inch minimum thickness).
5. Adjustment or replacement of frame and covers on sewer outfall manholes shall require frame to be set on flexible plastic gasket (as required by this Section) and anchored (along with any adjustment rings) to the manhole structure with four 1/2 inch diameter stainless steel threaded rods with nuts and washers. Rods shall be anchored into the existing structure using an epoxy adhesive conforming to ASTM C881, equal to the Hilti H/T RE 500 System, following the manufacturer’s instructions.

END OF SECTION

SECTION 33 05 14
PRECAST POLYMER CONCRETE MANHOLES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all materials, labor and equipment and construct manholes, as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit to the Owner Shop Drawings of the products specified herein. Shop Drawings of the precast structures shall show details of construction, reinforcing and joints.

B. Submit calculations for all manholes signed by a Professional Engineer licensed in the state of Georgia demonstrating the structure meets the design criteria specified herein.

1.03 INSPECTION

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Owner.

B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. Imperfections may be repaired, subject to the approval of the Owner, after demonstration by the manufacturer that strong and permanent repairs result.

1.04 MANUFACTURER QUALIFICATIONS

A. Manufacturer of polymer concrete structures shall have been continuously producing structures under its current name for a minimum of 4 years. Manufacturer shall have employed current manufacturing methods and material formulation for a minimum of 5 years. Information demonstrating these requirements shall be furnished upon request.

PART 2 PRODUCTS

2.01 PRECAST POLYMER CONCRETE MANHOLES

A. Precast polymer concrete manhole base, barrel and eccentric top sections shall conform to Specifications for Standard Specification for Polymer Concrete Pipe, ASTM D6783; Test Method for ignition Loss of Cured Reinforced Resins, ASTM D2584; Precast Reinforced Concrete Manhole Sections, ASTM C478; and for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures, ASTM C857. Manhole risers, transition slabs, cones, base and top slabs, and grade rings shall all be

of the same material. The method of construction shall conform to the Drawings and the following additional requirements:

1. Barrel sections shall have tongue and groove joints, unless otherwise approved by the Owner. Joints shall have elastomeric gaskets conforming to ASTM C443 and ASTM C990 standard specifications. Should an external wrap joint be required, it shall be in accordance with ASTM C877 with a minimum thickness of 60 mils. External wrap joints shall be resistant to corrosion or rotting under wet or dry conditions, rated for use in gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide, and other trace gases at installation site.
2. Materials of construction shall meet the Specifications for Polymer Concrete Pipe, ASTM D6783.
    a. Resin: The manufacturer shall use only polyester or vinyl ester resin systems designed for use with this particular application. Resin content shall be a minimum of 7 percent by weight.
    b. Polymer mixture: The mixture shall consist solely of thermosetting resin, sand, aggregate and quartz powder.
    c. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, and thixotropic agents, when used, shall not be detrimental to the structural integrity and life of the manhole.
3. Polymer concrete shall have a minimum unconfined compressive strength of 9,000 psi when measured in accordance with ASTM C497.
4. The date and location of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
5. Top sections shall be eccentric except that precast slabs shall be used where cover over the top of the pipe is less than 4 feet for all manholes.
6. Precast slabs over top section, where required, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.
7. Manholes steps shall conform to ASTM C478. Steps shall be Plastic Step by M.A. Industries, Inc., or equal.
8. Holes in precast sections to receive sewer pipe shall be precast at the factory at the required locations. All pipe seals shall be in accordance with ASTM C923, shall have a demonstrated history of providing watertight seal between pipe and manhole. All precast holes shall have compression or boot type seals.
9. The tops of bases shall be suitably shaped to mate with the precast barrel section.
10. All manholes with flat slab tops, except those located in paved areas or where precise adjustment of top elevation is required, shall be furnished with the cover frame cast into the top section.
11. Each manhole component shall be free of defects, including indentations, cracks, foreign inclusions, and resin starved area that, due to their nature and degree or extent, detrimentally affect the strength and service of the component.
12. Manholes shall be reinforced per ASTM C478.
13. Manholes shall have a monolithic base slab.

Manhole minimum wall thickness shall be demonstrated as suitable by calculations as required by submittals described in these Specifications.

B. Frame and cover assemblies shall be manufactured of composite materials, specifically of fiber reinforced polymer (FRP), consisting of between 45 percent and 70 percent fiber reinforcement by weight. Assembly shall be round, black in color, be of a platen solid cover style, have a heavy-duty load rating, unlabeled, have four integrated stainless steel paddle locks and a pick bar. Frame shall be cast into the top cone section and the cover shall include an integrated elastomeric gasket to resist odor releases and storm water inflow. Composite manhole frame and cover assemblies shall be provided by an approved manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manholes and other precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications.

B. Precast structure sections shall be set to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed.

C. If possible, holes in the manhole sections required for handling or other purposes shall not penetrate completely through the wall. Any penetrating lifting holes shall be permanently plugged.

D. Where holes must be field cut in the precast sections to accommodate pipes, the holes shall be cored to provide a smooth sealing surface for connecting boots or compression seals. All coring shall be done prior to setting the manhole sections in place.

E. Invert Channels:

1. Invert channels can be precast with polymer concrete or can be constructed in the field after the manhole and pipe have been installed. If constructed in the field, the bench and channel shall be constructed with all resin aggregate material recommended by the manhole manufacturer. Alternative fill material is prohibited.
2. Manholes shall have an invert channel shaped to correspond with the lower half of the pipe to provide smooth flow transition with no disruptions of flow at pipe-manhole connections. Provide curve transitions for side inlets and smooth pipe invert fillets for flow transitions between pipe inverts. The top of the shelf shall be sloped to drain toward the flowing through channel.

F. The shipping, handling, and installation of the manholes shall be in accordance with the manufacturer’s recommendations.

G. Where adjustment or replacement of a manhole frame and cover is necessary, the following requirements shall apply:

1. Adjustment of frame and cover to grade shall be accomplished with a precast polymer concrete and/or HDPE leveling rings, fully bedded in portland cement mortar. In no case shall vertical adjustment exceed 14 inches.
2. The top of the frame shall be set flush with, and match the slope of, the surrounding pavement.
3. Frame shall be set in a portland cement mortar bed (1-1/2 inch maximum thickness).
4. Exterior surface of rings used in leveling course area shall be coated with a portland cement plaster (1/2 inch minimum thickness).
5. Adjustment or replacement of frame and covers on sewer outfall manholes shall require frame to be set on flexible plastic gasket (as required by this section) and anchored (along with any adjustment rings) to the manhole structure with four 1/2 inch diameter stainless steel threaded rods with nuts and washers. Rods shall be anchored into the existing structure using an epoxy adhesive conforming to ASTM C881, equal to the Hilti H/T RE 500 System, following the manufacturer's instructions.

END OF SECTION

SECTION 33 31 00
SANITARY SEWER PIPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide labor, equipment, materials, and incidentals necessary to install and test all sanitary sewer piping and appurtenances. Gravity sanitary sewer lines shall be as specified herein.

B. Pipe materials shall be as indicated in the Contract Documents. Where materials are not specifically indicated, the Contractor may use any of the materials specified herein, appropriately applied based on the project conditions and the approval of the Owner.

1.02 RELATED WORK

A. Clearing, grubbing, installation of manholes, trench excavation and backfill, temporary flow control, and cutting and replacing pavement shall be as specified in other sections.

1.03 SUBMITTALS

A. Submit shop drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01 33 00 - Submittals, of these specifications.

B. Submit certification of compliance, manufacturer’s installation procedure, factory testing procedure and test results.

1.04 INSPECTION

A. Materials to be installed under this Contract may be inspected, at the site of manufacture, by the Owner for compliance with these Specifications.

1.05 DESIGN CRITERIA

A. Reference Standards of the American National Standards Institute (ANSI), the American Society of Testing of Materials (ASTM), and the American Waterworks Association (AWWA).

1. ANSI / AWWA C151/A21.51, AWWA Standard for Ductile-Iron Pipe, Centrifugally Cast.
2. ANSI / AWWA C153 / A21.53, AWWA Standard for Ductile-Iron Compact Fittings for Water Service.
3. ANSI / AWWA C115 / A21.15, AWWA Standard for Flanged Ductile-Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
4. ANSI / AWWA C111 / A21.11, AWWA Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
6. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
7. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
8. ASTM F794 Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
9. ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
10. ASTM D3262 Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
11. ASTM D3681 Standard Test Method for Chemical Resistance of “Fiberglass” (Glass–Fiber–Reinforced Thermosetting-Resin) Pipe in a Deflected Condition.

B. All materials, testing, and incidentals referenced by the Standards and Specifications mentioned herein are to conform to the latest revisions.

C. All public sewer piping shall not be less than 8 inches in diameter.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall meet the following requirements and be as specified hereinafter.

1. Ductile iron pipe shall be of the centrifugally cast type, either in metal or cast molds, and shall conform to ANSI A21.51 or AWWA C151. Ductile iron shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi. Pipe wall thickness shall be required by laying conditions and depth of cover. Pipe shall be furnished in industry standard lengths complete with all necessary glands, joint material, including rubber gaskets lubricant, bolts and nuts. Pipe furnished shall be as manufactured by U.S. Pipe and Foundry and American Cast Iron Pipe; McWane Ductile; or equal.
2. All ductile iron pipe used for below-grade service in the project shall have push-on joints and shall meet the requirements of ANSI A21.11 or AWWA C111, latest revisions. Ductile iron pipe used in the project for above-ground service or in below-ground vaults shall have flanged joints conforming to the requirements of ANSI A21.15, latest revision.

B. Fittings:

1. All pipe fittings shall be ductile iron and shall be of a standard design for use with the pipe purchased under these specifications. Fittings shall conform to the following applicable specification.
   a. Mechanical Joint fittings: Fittings shall be ductile iron compact fittings conforming to ANSI A21.53. The rubber gasket joints shall

conform to ANSI A 21.11. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.

b. Flanged Fittings: Shall conform to ANSI A21.10 or A21.11 and shall have flanges faced and drilled in conformance with ANSI Standard A21.15. Joints shall be installed with full ring rubber gasket. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.

2. The proper number of gaskets and all necessary joint materials shall be furnished with the pipe fittings.

C. Coatings and Linings:

1. Ductile iron pipe and fittings shall be coated on the exterior with a 1.0 mils thick bituminous coat in accordance with ANSI/AWWA C151/A21.51.
2. Ductile iron pipe and fittings 8-inch diameter and smaller shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI / AWWA C104/A21.4.
3. Ductile iron pipe and fittings 10-inch diameter and larger shall be lined with a ceramic epoxy complying with ASTM B117 and ASTM D714, and meeting a standard equal to PROTECTO 401 Ceramic Epoxy Lining manufactured by Induron Coatings, Inc.

D. Restrained Joints:

1. Sections of ductile iron piping (including fittings) designated in the Contract Documents as having restrained joints shall be constructed using approved pipe and fittings equal to those listed below:
   a. U.S. Pipe and Foundry Company; TR-FLEX.
   b. American Ductile Iron Pipe Company LOK FAST or LOK RING.
   c. McWane Ductile; TR FLEX.
2. Restrained joint pipe sections where specifically noted shall utilize approved basic push-on joints with special gaskets equal to:
   a. U.S. Pipe and Foundry Company; FIELD LOK 350 GASKET.
   b. American Ductile Iron Pipe Company; FAST-GRIP GASKET.
   c. McWane; SURE STOP 350 GASKET.
3. Approved Wedge action retainer glands where specifically noted or directed shall be used in conjunction with other conventional thrust restraint devices (rodding, thrust blocking, thrust collars) and shall be equal to:
   a. EBAA Iron; Megalug.
   b. Ford Uni-Flange; Series 1400.
   c. U.S. Pipe and Foundry M. J. Field Lok Gasket.

2.02 SDR-35 POLYVINYL CHLORIDE PIPE

A. Polyvinyl Chloride (PVC) Pipe for Gravity Sewers: Class-rated PVC pipe and accessories where shown or as specified on the Drawings, shall meet extra strength minimum of SDR-35 of the requirements of ASTM D3034 for 4-inch through 15-inch and ASTM F679 for 18-inch through 27-inch. Pipe shall be furnished in industry standard lengths. Pipe and accessories shall bear the NSF mark indicating its class, pipe size, manufacturer's name, AWWA and/or

ASTM Specification number, working pressure and production code. Pipe and couplings shall be made from Class 12454-A or Class 12454-B virgin compound, as designed in ASTM D1784.

B. Joints: The PVC joints for pipe four inches in diameter and greater shall be of the push-on, bell-and-spigot type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket. Gaskets shall be factory installed and meet the requirements of ASTM F477. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75 degrees F in each joint per length of pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which shall meet requirements of ASTM D3212. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.03 RIBBED (OPEN PROFILE) POLYVINYL CHLORIDE PIPE

A. Ribbed (Open Profile) Polyvinyl Chloride (PVC) Pipe for Gravity Sewers: Class-rated PVC pipe and accessories where shown or as specified on the Drawings, shall meet the requirements of ASTM F794 and UNI-BELL Uni-B-9 for 8-inch through 27-inch. The pipe shall be homogeneous and have a smooth interior with a solid cross-sectional rib exterior. Exterior ribs shall be open profile and perpendicular to the axis of the pipe. Pipe shall be green in color and furnished in industry standard lengths. Each length of pipe shall be marked indicating its size, manufacturer's name, product type, PVC cell classification, ASTM F794, and date of manufacture.

B. Joints: The PVC joints for pipe four inches in diameter and greater shall be of the push-on, bell-spigot type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket pretensioned around the spigot of the pipe and assembled by insertion into a smooth bell. The gasket shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75 degrees F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.04 HOLLOW CORE (CLOSED PROFILE) POLYVINYL CHLORIDE PIPE

A. Hollow core (Closed Profile) polyvinyl chloride (PVC) Pipe for Gravity Sewers: Class-rated PVC pipe and accessories where shown or as specified on the Drawings, shall meet the requirements of ASTM F794 and UNI-BELL Uni-B-9 for 21-inch through 48-inch. The pipe shall be homogeneous and have a smooth interior and exterior with a hollow core closed profile wall section and minimum stiffness of 46 psi when tested in accordance with ASTM D2412. Pipe shall meet the minimum cell classification of 12364A as defined by ASTM D1784. Pipe shall be white in color and furnished in industry standard lengths. Each length of pipe shall be marked indicating its size, manufacturer's name, product type, PVC cell classification, ASTM F794, and

date of manufacture. Each length of pipe shall pass a factory 3.5 psi air test as described in ASTM F794.

B. Joints: The PVC joints for pipe four inches in diameter and greater shall be of the push-on, bell-spigot type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe of fitting socket and the forcing of the plain end of the entering pipe into the socket. The gasket shall be factory installed and chemically bonded to the bell end of the pipe and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75 degrees F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.05 GLASS FIBER REINFORCED THERMOSETTING RESIN PIPE

A. Glass fiber reinforced thermosetting resin pipe (GRP) and fittings shall meet all requirements of ASTM D3262 and shall have a minimum pip stiffness of SN46. Manufacturer shall use polyester or vinyl ester resin system with proven history of performance for pipe manufacturer. Pipe shall be furnished in nominal 20-foot lengths marked with AWWA specification number, size, type and grade, pressure class, manufacturers mark and identity code, and date of manufacture. In accordance with ASTM D4161 the pipe shall have interior corrosion liner of reinforced thermoset liner highly resistant to exposure to sulfuric acid with Glass Reinforcement Grade C. The pipe and fittings shall be rated and fittings shall be rated for 150 psi working pressure.

B. Joints: The joints for pipe shall be glass-reinforced plastic sleeve couplings in accordance with ASTM D4161.

2.06 TRANSITION COUPLINGS

A. Manufactured specialty transition couplings shall be utilized at locations to connect gravity sewer piping of different materials. Couplings shall be specifically sized to address the variations in pipe diameters, and wall thicknesses.

B. Rigid PVC (C900 DR18 Class 150) transition couplings as manufactured by HARCO Corporation, Specified Fittings, Inc., or mechanical joint, compact style, ductile iron solid sleeves (with appropriate transition gaskets) shall be the manner of connection.

PART 3 EXECUTION

3.01 GENERAL

A. Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or coatings. Pipe shall be protected during handling against impact shocks and free fall and shall be kept clean at all times. No forks, chains, straps, hooks shall be placed inside the pipe and/or fittings for lifting, positioning, or installing material. All pipe or fittings shall be examined

before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Owner.

B. The Owner shall be notified 24 hours prior to construction beginning on Sewer facilities. Pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective pipe is discovered after it has been installed it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until they are used in the work, and when installed, shall conform to the lines and grades required.

C. Contractor must have a set of the original Contract plans at all times on the Job Site. These plans shall be kept current by the Contractor in regards to field changes.

D. All pipe shall be laid true to the required lines and grades and shall slope uniformly between joints. All pipe shall be laid upgrade with bell end of pipe upgrade.

E. Extreme care shall be used when constructing piping to protect all existing underground utilities, and all existing structures. Any damage to existing utilities or structures shall be repaired or replaced and restored equal to or better than pre-construction conditions.

3.02 CONNECTION TO EXISTING SANITARY SEWERS

A. For existing lines installed under other contracts, to which piping of this Contract must connect, the Contractor shall expose buried lines to confirm or determine pipe material and diameter, furnish, and install appropriate piping, and make proper connections.

B. Where shown on the plans or directed by the Owner, new sewers shall be connected to existing sewers either by constructing a manhole over an existing line (doghouse manhole), or by coring through the wall of an existing manhole.

1. Doghouse Manhole: New manhole shall be set over the existing pipe, and the inverts properly formed in accordance with the Standard Detail. The lower half of the old pipe may be used as the new invert if the condition of the existing pipe is deemed suitable by the Owner. Doghouse manholes shall not be installed on clay or truss pipes, direction shall be given by the owner in the event these pipes are encountered.
2. Existing Manhole: The opening for the new pipe shall be cored at the proper elevation, using proper coring equipment, and the sewer pipe inserted with the appropriate manhole boot connection. The manhole shall be repaired in the field including any liner. A channel shall then be formed over the manhole table, or the table cut out and the invert formed in it, as required by grade.

C. When connecting to active sewer lines, either at an existing manhole or with a new doghouse manhole, the newly installed sewer line shall be plugged with a temporary plug. This plug will remain in place until the successful completion of the Final Inspection and will only be removed under the authorization of the Owner. If deemed necessary by the owner, the contractor shall perform temporary flow control measures as outlined by in other sections of the specifications.

3.03 INSTALLATION

A. Sanitary sewers shall be installed to the lines and grades indicated on the Contract Drawings. No deviation from the designed alignment and/or grades and elevation shall be made without prior approval of the Owner.

B. A pipe laser shall be used for horizontal and vertical control of the sewer pipe installation. Also, elevation measurements shall be made with surveying instruments as the work progresses at least at each manhole to verify the accuracy of grades. These measurements shall be recorded in the Contractor’s Daily Report and made available to the Owner upon request. The Owner shall be notified immediately of any variations from design grades.

C. All pipe shall be sound and clean before installing. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying.

D. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Lining shall be undamaged.

E. Unless otherwise noted in the Contract, underground piping shall be push-on. Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined and pushed home with a jack or by other means. Hydraulic excavators, backhoes, or other machinery shall not be used to push slip-joint pipe together. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

F. The Contractor shall carefully regulate their equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall be replaced at the Contractor's expense.

G. A watertight plug or bulkhead shall be installed and maintained throughout construction in the most downstream manhole of the project to prevent dirt, rocks, muddy water, or other debris from entering the existing sewer system. This plug or bulkhead shall not be removed until the entire sewer has been

installed, cleaned, tested, and accepted, unless otherwise directed by the Owner.

3.04 BEDDING OF SEWER PIPE

A. Bedding for all sanitary sewer pipes shall be as shown in the Contract Documents and meet the requirements in Section 31 23 33 - Trenching and Backfilling. Bedding shall be defined as that method of bedding trench conduits in which the conduit is set in thoroughly tamped, compacted, granular materials placed to the trench width and up to the centerline of the conduit. The remainder of the conduit is entirely surrounded to a height of at least one foot above its top by densely compacted backfill carefully placed by hand to completely fill all spaces above and adjacent to the conduit.

3.05 SERVICE LATERAL STUB-OUTS AND CLEANOUT ASSEMBLIES

A. All sewage service lateral stub-outs, either from the sewer main or from a manhole, shall be a minimum of 6-inch-diameter; be SDR 35 PVC or; of the same pipe material as the sewer main; installed at a minimum 1.00 percent slope; and terminate with a cleanout assembly at the permanent easement or right-of-way limit as indicated on the Drawings. The tee-wye branch fitting on the sewer main shall be of the same pipe material as the main. Service lateral stub-out elevation at the clean-out assembly shall be sufficient to allow 1.00 percent minimum slope from that point to the residence's or business' plumbing connection (or the building finished floor elevation minus 2 feet, if plumbing elevation is unknown).

B. All horizontal bends (if required) as well as all service lateral stub-out terminations shall require 6-inch cleanout assemblies. If in an unfinished area, cleanout assembly shall extend a minimum of 3 feet above grade. In finished areas cleanout assembly shall be installed with a 15-inch-diameter cast iron ring and cover (Vestal RMC-15-H, East Jordan Iron Works V-8502, US Foundry USF-7621 or equal) flush with ground surface. In either case the cleanout assembly shall be permanently marked on the curb showing the location of the cleanout.

3.06 UTILITY TRACER SYSTEM

A. All sanitary sewer pipelines shall have a utility tracer system installed in accordance with the Contract Drawings. A continuous, insulated, 12-gauge, solid copper tracer wire shall be placed with the initial backfill. The tracer wire shall continue uninterrupted around manholes. Service lateral stub-outs shall have the same tracer wire installation with a copper-to-copper splice connection to the main tracer wire. Tracer wire shall either wrap around or be taped to the cleanout assembly and shall terminate with a 12-inch coil accessible at the cleanout cover.

B. Tracer wire shall be 12 AWG solid copper rated for direct bury with minimum 30-mil polyethylene insulation. All underground splices and connections shall be protected with direct-bury connectors equal to 3M DBR/Y-6 Splice Kits.

C. A polyethylene, 6-inch wide, yellow warning tape marked “Sewer Line Buried Below” shall be placed in the trench backfill approximately 24 inches above the tracer wire.

3.07 CLEANING MAINS

A. At the conclusion of the Work and prior to pressure testing, the Contractor shall thoroughly clean the new pipeline by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. The flushing water and debris will be trapped at the last downstream manhole and removed from the system.

3.08 INSPECTION AND TESTING OF UNDERGROUND GRAVITY SEWERS

A. Infiltration of groundwater into sewer line shall not exceed 25 gal/day per inch of diameter per mile of sewer. All confirmed and/or visible leaks shall be repaired whether or not infiltration limits are exceeded.

B. Contractor shall air test all gravity lines following completion of construction and pipe cleaning. Contractor shall furnish all necessary equipment and materials for testing including but not limited to pressure gauges, plugs, pumps, bulkheads, and miscellaneous piping. The following procedures shall be used:

1. The Contractor shall isolate the test section with required plugs and bulkheads.
2. The Contractor shall pressurize the test section to 4.0 psi greater than the average back pressure of groundwater around the sewer (add 0.43 psi to test pressure for each vertical foot that the groundwater is above the top of the pipe).
3. Allow 3 minutes for the pressure to stabilize.
4. The pressure shall not decrease more than 0.5 psi during the time periods shown below:

Time/100 ft.		
Pipe Diameter (Inches)	**Minutes**	**Seconds**
8	1	12
10	1	30
12	1	48
14	2	00
15	2	06
16	2	12
18	2	24
20	2	48
21	3	00
24	3	36

Time/100 ft.		
Pipe Diameter (Inches)	**Minutes**	**Seconds**
27	4	12
30	4	48
36	6	00

C. All PVC pipe must pass a 5 percent deflection test as follows: Not before 30 days after pipe is laid and backfill placed, the Contractor shall test the pipe for deflection. A mandrel sized to permit up to 5 percent deflection shall be used.

SDR-35 PVC Pipe			
Nominal Pipe Size	**Average Inside Diameter**	**Base Inside Diameter**	**5% Deflection Mandrel**
6	5.893	5.742	5.45
8	7.891	7.665	7.28
10	9.864	9.563	9.08
12	11.737	11.361	10.79
15	14.374	13.898	13.20

D. A visual inspection (“lamp test”) of each reach of the sewer line will be performed by the Owner or its representative to detect sags or misalignment of the section. A full circle of light must be visible through the pipe between manholes.

E. Contractor shall CCTV inspect the interior of all gravity sewer lines following the completion of all other testing and prior to any street paving. A hard copy of the inspection log and digital copy of the inspection video on USB flash drive shall be provided to the Owner.

1. All CCTV inspections shall be performed by personnel certified in accordance with the Pipeline Assessment and Certification Program (PACP) standards as provided by the National Association of Sewer Service Companies (NASSCO) and using PACP Data Standards and nomenclature, including the specific date and time of the inspection, as well as other points of significance such as tap locations, unusual conditions, infiltration points, and other discernible features.
2. Camera used for the inspection shall be specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. All components of the video system must be capable of producing picture quality that is to the satisfaction of the Owner.

3. Inspection logs shall include the following information as a minimum:
    a. Title: Project Name and Project Number.
    b. “Performed for Cobb County Water System”.
    c. Time of day.
    d. Manhole ID (Contract Drawings).
    e. Manhole to manhole pipe section.
    f. Pipe segment length.
    g. Pipe material.
    h. Pipe diameter.
    i. Direction of camera travel (upstream, downstream).
    j. Pipe depth.
    k. Operator name.
    l. Tape counter reading at beginning and end of each manhole-to-manhole pipe segment.
4. USBs shall be submitted in a format readable with standard viewing software such as Windows Media Player. USBs that require a specific software program will not be accepted.
5. Contractor shall maintain a copy of all inspection documentation (USBs, databases, and logs) for duration of Contract and guaranty period.

F. If any section fails to meet the infiltration, deflection, air test, and/or visual inspection requirements, the Contractor shall determine the source(s) of leakage or deflection and make necessary repairs and retest the repaired section, all at no additional cost to Owner.

G. The Contractor shall provide all necessary equipment to ensure safe access to perform the visual inspections, including but not limited to oxygen/hazardous gas monitoring devices, ventilation equipment, OSHA approved body harness and lifting apparatus.

END OF SECTION