SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 DIVISION 0 AND DIVISION 1 WORK INCIDENTAL TO THE CONTRACT PRICE

A. No separate measurement or payment will be made for work called for in Division 0 or Division 1 of the Contract Specifications, unless specifically covered under the Bid Items listed below. All costs associated with this work shall be considered incidental to the Contract Bid Price.

B. Division 2 through Division 16 work will be measured and paid for at the Contractor's unit bid price or lump sum item cost as indicated on the Bid Form. Those payable work items, and related prices as bid, shall be the basis for all compensation to the Contractor for work performed under this Contract. Work not specifically included as a bid item, but which is required to properly and satisfactorily complete the work is considered ancillary and incidental to the bid item work, and payment for such work is considered to be included in the values as bid for payable items. Compensation for all work shall be made as a measured quantity of work under the appropriate bid items.

1.2 ABANDONMENT OF EXISTING WATER MAINS (ITEM #1)

A. Measurement

1. There shall be no measurement for this Item as this work shall be on a lump sum basis.

B. Payment

1. Payment of the lump sum bid price for the removal or abandonment of existing water mains shall include cut and caps, valve box abandonment and all incidental work as shown on the Drawings and specified herein, shall be full compensation for all labor, equipment, and materials required for or incidental to this work.

2. If the segment of pipe requiring removal is asbestos cement, then payment shall be made under Item #9.

1.3 UNSUITABLE MATERIAL EXCAVATION, REMOVAL, & DISPOSAL (ITEM #2)

A. Measurement

1. The quantity shall be determined by measurements made in the field based on the actual quantity of earth material deemed not suitable for reuse, excavated, and properly disposed of offsite, as authorized by the Engineer.

B. Payment

1. Payment of the bid price for each cubic yard of below grade excavation shall be full compensation for all excavation, removing and disposing of material, placing and removing sheeting or bracing, including all labor, equipment and materials required or incidental to complete the work specified. The excavation, removal, and disposal of existing concrete driveway to be replaced

with bituminous concrete pavement shall be included in this item. The excavation, removal, and disposal of existing concrete that is replaced with new concrete shall not be paid for under this item, but shall be included in the item ‘Cement Concrete Sidewalk / Pavement’.

1.4 CONNECT NEW WATER MAIN (ITEM #3)

A. Measurement

1. Each new tie-in of the proposed water main to an existing water main as shown on the Drawings and defined herein shall not be measured for payment. The work shall include for each tie-in (connection), all fittings, nipples, bends, thrust restraints, tapping sleeves, corporation stops, and all labor, materials and equipment incidental thereto. This work shall be paid for on a lump sum basis. Valves shall be included in valve items.

2. Surface restoration is not included in this item. Surface restoration shall be paid for separately under the applicable bid item.

3. Gate valves are not included in this item and shall be paid for separately under the applicable bid item.

B. Payment

1. Payment of the lump sum bid price for Connect New Water Main shall be full compensation for furnishing and installing all materials required. The lump sum price shall include all fittings, nipples, bends, thrust restraints, tapping sleeves, tees, corporation stops, as shown on the Drawings and specified herein, and as required to complete the connections.

2. Also included in this item is all excavation, backfill, compaction, and all labor, equipment, materials and other appurtenant work required or incidental to completion of this item.

1.5 LOAM AND SEED (ITEM #4)

A. Measurement

1. Measurement for loam and seed shall be on a square yard basis as measured in the field by the Engineer. The length shall be the actual length loamed and seeded. The width shall be limited to that shown on the "Trench Section in Tree Belt” detail or the actual width of repair, whichever is less.

2. Measurement for payment under this item shall be for loaming, fertilizing, and grass seed work as required for lawn restoration and/or for "lawn quality" restoration of disturbed areas, based on project pay lines. Additional areas considered for measurement shall only be authorized by the Engineer.

B. Payment

1. Payment of the bid price for loam and seed shall be full compensation for all labor, equipment, and materials required for or incidental to the work. Loaming and seeding outside of the designated paylines may be required, but will not be paid for under this item unless otherwise directed by the Engineer.

1.6 TEST PIT EXCAVATION (ITEM #5)

A. Measurement

1. Measurement for ‘Test Pit Excavation’ shall be on a cubic yard basis. The dimensions of excavation shall be actual, but in no case shall this exceed the dimensions approved by the Engineer.

B. Payment

1. Payment of the bid price for ‘Test Pit Excavation’ shall be full compensation for excavation of a test pit suitable for the safe examination of subsurface conditions as approved by the Engineer. Price shall also include backfilling and compaction of excavation in appropriate lift depths, and disposal of surplus material.

1.7 ORDINARY BORROW (ITEM #6)

A. Measurement

1. Measurement for ordinary borrow shall be on a cubic yard basis. The depth of ordinary borrow shall be actual depth placed in the completed work, but in no case will this exceed the depth approved by the Engineer. The width shall be the same as the width of the excavation but shall not exceed the limits shown on the "Trench Section” details on the Drawings. Ordinary Borrow shall only be paid for when placed at locations where the existing soil materials are considered unsuitable for reuse by the Engineer.

B. Payment

1. Payment of the bid price for ordinary borrow shall be full compensation for furnishing, hauling, placing, spreading, compacting including all labor, equipment, and materials required for or incidental to the work.

1.8 GRAVEL BORROW (ITEM #7)

A. Measurement

1. Measurement for gravel borrow shall be on a cubic yard basis. The depth of gravel borrow shall be the actual depth placed in the completed work, but in no case shall this exceed the depth approved by the Engineer. The width shall be the same as the width of the excavation but shall not exceed the limits shown on the "Trench Section” details on the Drawings. Gravel Borrow shall only be paid for when placed at locations where the existing soil materials are considered unsuitable for reuse by the Engineer.

B. Payment

1. Payment of the bid price for gravel borrow shall be full compensation for furnishing, hauling, placing, spreading, compacting, including all labor, equipment and materials required for or incidental to the work.

1.9 CONTROLLED DENSITY FILL (ITEM #8)

A. Measurement

1. Measurement for controlled density fill shall be on a cubic yard basis. The depth of controlled density fill shall be the actual depth placed in the completed work, but in no case shall this exceed the depth approved by the Engineer. The width shall be the same as the width of the excavation but shall not exceed the limits shown on the "Trench Section" details on the Drawings. Controlled density fill shall only be paid for when placed at locations where shown on the drawings or where approved by the Engineer.

B. Payment

1. Payment of the bid price for controlled density fill shall be full compensation for furnishing, hauling, placing, spreading, consolidating, including all labor, equipment and materials required for or incidental to the work.

1.10 ASBESTOS CEMENT PIPE REMOVAL AND DISPOSAL (ITEM #9)

A. Measurement

1. Measurement for the removal and disposal of existing asbestos cement water main at the water main tie-ins or cut and cap locations, or at other locations encountered in the project shall be on a linear foot basis as approved by the Engineer.

B. Payment

1. Payment of the bid price shall be full compensation for the removal, disposal, and certificates of disposal, for the asbestos cement water main pipe and all labor, equipment, and materials required for or incidental to the work.

2. Payment for the removal of existing asbestos cement water mains shall only be made for work within the mainline trench, or as specified at interconnections and cut and cap locations, or at other locations encountered in the performance of the work as approved by the Engineer.

1.11 8" DUCTILE IRON PIPE AND FITTINGS (ITEM #10)

A. Measurement

1. Measurement for ductile iron pipe and fittings shall be on a linear foot basis and shall be along the ground surface above and parallel to the pipeline from the point of beginning to the point of termination. No deductions will be made for the length of valves, fittings, and appurtenances. Allowances for the cost of main line fittings and tees shown on the Drawings shall be included in the pipe unit price.

B. Payment

1. Payment of the bid price for ductile iron pipe and fittings shall be full compensation for all pavement removal, excavation, backfill, trench dewatering, warning tape, clearing and grubbing, and for providing of all pipes, bends, fittings (including retainer glands), provisions for electrical continuity and appurtenances, disinfection, flushing, testing, thrust blocks (not included in Item #3), and all labor, equipment and materials required for or incidental to the work.

1.12 1-1/2" COPPER TUBING FOR WATER SERVICES (ITEM #11)

A. Measurement

1. Measurement for 1-inch diameter Type K copper tubing for water services shall be in-place, in the trench as a straight run from the corporation cock to the point of connection to the old service at curb stop or coupling.

B. Payment

1. Payment of the bid price shall be made for each linear foot of Type K copper tubing. Said payment shall be full compensation for all pavement removal, excavation, compaction and backfill, and all labor, equipment, materials and other appurtenant work required for or incidental to complete the installation.

1.13 8" GATE VALVE AND BOX (ITEM #12)

A. Measurement

1. Measurement for gate valves and boxes shall be a count of the number of items provided.

B. Payment

1. Payment of the bid price shall be full compensation for each gate valve and box provided including all labor, equipment, and materials required for, or incidental to the work.

1.14 WATER SERVICE CORPORATION (ITEM #13)

A. Measurement

1. Measurement for water service corporations shall be a count of the number of water service corporations provided.

B. Payment

1. Payment of the bid price for each water service corporation provided shall be full compensation for all labor, equipment, and materials required for, or incidental to the work.

1.15 HYDRANT ASSEMBLY (ITEM #14)

A. Measurement

1. Measurement for hydrant assemblies shall be a count of each hydrant assembly provided and connected to the proposed water main.

B. Payment

1. Payment of the bid price for each hydrant assembly provided shall be full compensation including the hydrant, main line tee, stone drain pocket, pavement removal, excavation, backfill, dewatering, clearing and grubbing, thrust blocks, hydrant lateral valve and box, all required 6-inch DI pipe, and all labor, equipment, and material required for or incidental to the work. In areas where extensions are required to bring the hydrant to grade, the cost shall be included in this item.

1.16 REMOVAL OF EXISTING HYDRANT (ITEM #15)

A. Measurement

1. Each existing hydrant that is removed and either delivered to the DPW yard, or disposed of, shall be counted and paid for under this Item.

B. Payment

1. Payment of the bid price for each existing hydrant removed from the work shall be full compensation for all excavation, backfill and compaction, cutting and capping of the existing branch nipple, removal of the hydrant valve gate box, delivery and stacking at the DPW yard, or properly disposed of (at the discretion of the DPW), and all labor, equipment, materials and other appurtenant work related thereto.

2. All surface repairs directly related to the removal of the existing hydrant shall be paid for under the applicable items.

1.17 WATER SERVICE CURB STOP AND BOX (ITEM #16)

A. Measurement

1. Measurement for water service curb stop and box shall be a count of the item provided.

B. Payment

1. Payment of the bid price for each water service curb stop and box shall be full compensation for all labor, equipment, and materials required for, or incidental to the work. Payment of the bid price shall be full compensation for each 1-1/2-inch curb stop and box furnished and installed complete in place, including reconnection of existing water service, coupling, and all labor, equipment, materials and other appurtenant work required or incidental for a complete installation.

1.18 CEMENT CONCRETE SIDEWALK / PAVEMENT (ITEM #17)

A. Measurement

1. Measurement for cement concrete sidewalk / pavement shall be on a square yard basis as measured by length and width, accepted in the field by the Engineer.

B. Payment

1. This work shall include the construction of concrete sidewalk and wheelchair ramps, concrete driveway, and shall include the placement of concrete pavement base in trench sections under Route 5. Work shall consist of removal / disposal of existing sidewalk, compaction of subgrade, installation of concrete, tactile warning panels, and application of curing compound/sealers, in conformance with the details shown on the Drawings. All excavation necessary to install concrete formwork shall also be included under this item.

1.19 MOBILIZATION AND DEMOBILIZATION (ITEM #18)

A. Measurement

1. There shall be no measurement for the mobilization and demobilization to the project locations as this work shall be paid for on a lump sum basis.

B. Payment

1. Payment of the lump sum bid price shall be paid in two equal installments. The first installment will occur at the time the first pay requisition is submitted when the Contractor has initiated full-time construction activity. This payment will be 80% of the item's bid price. The second installation will be paid when the Contractor has completed all construction activity including final cleanup and punch list items. The second payment will be 20% of the item's bid price. In no case shall the total of both installments exceed 5 percent of the base bid price.

1.20 TRAFFIC CONTROL (ITEM #19)

A. Measurement

1. There shall be no measurement for the traffic control signage as this work shall be on a lump sum basis.

B. Payment

1. Payment of the lump sum bid price shall be full compensation for all labor, equipment, and materials required or incidental to the traffic control work.

2. Payment will be made on a monthly basis as a percentage of the base bid price for that particular month.

1.21 STEEL DOWELS (DRILLED & GROUTED) (ITEM #21)

A. Measurement

1. Measurement of steel dowels shall be a count of the item provided.

B. Payment

1. Payment of steel dowels shall include all work associated with installation of 20-inch steel dowels as shown on the Drawings, the bid price shall be full compensation for all labor, equipment, and materials required or incidental to the work.

1.22 HOT MIX ASPHALT SURFACE COURSE (ITEM #21)

A. Measurement

1. Hot Mix Asphalt shall be measured by the ton for the material in place, graded and compacted to the line and grade as directed and approved by the Engineer. The quantity is to be determined only by weight slips that have been properly countersigned by the Engineer at the time of delivery.

B. Payment

1. The tonnage of hot mix asphalt determined as provided above, shall be paid for at the contract unit bid price per ton, including all labor, materials, and other incidental work, as required to place the hot mix asphalt in a manner acceptable to the Engineer. Payment by the ton shall also include cleaning the roadway, and the removal of any debris prior to the placement of any mixture.

1.23 HOT MIX ASPHALT BINDER COURSE (ITEM #22)

A. Measurement

1. Hot Mix Asphalt shall be measured by the ton for the material in place, graded and compacted to the line and grade as directed and approved by the Engineer. The quantity is to be determined only by weight slips that have been properly countersigned by the Engineer at the time of delivery.

B. Payment

1. The tonnage of hot mix asphalt determined as provided above, shall be paid for at the contract unit bid price per ton, including all labor, materials, and other incidental work, as required to place the hot mix asphalt in a manner acceptable to the Engineer. Payment by the ton shall also include cleaning the roadway, and the removal of any debris prior to the placement of any mixture.

1.24 BITUMEN TACK COAT (ITEM #23)

A. Measurement

1. Bitumin for tack coat shall be measured by the gallon for material placed, and approved by the Engineer. The contractor shall be responsible for supplying the Engineer with weigh slips showing the amount of material delivered in gallons. The Engineer will calculate the amount used by straight measurement of what remains in the dispensing tank.

B. Payment

1. The quantity of bitumen for tack coat determined as provided above, shall be paid for at the contract unit bid price per gallon, including all labor, materials, and other incidental work, as required to place the product in a manner acceptable to the Engineer.

1.25 BITUMINOUS CONCRETE BERM (ITEM #24)

A. Measurement

1. Bituminous concrete berm shall be measured in place on a linear foot basis. The length of berm to be paid for shall be the actual length of berm shown on the Drawings or otherwise approved by the Engineer.

B. Payment

1. Payment of the bid price for each linear foot of bituminous concrete berm, shall be full compensation for all labor, equipment and materials required for providing bituminous concrete berm. This shall include excavation, formation of subgrade, gravel borrow, paved berm pad, and the HMA berm.

1.26 SAWCUT BITUMINOUS CONCRETE AND CONCRETE PAVEMENT (ITEM #25)

A. Measurement

1. Measurement shall be along the ground surface.

B. Payment

1. Payment of the bid price for each linear foot of sawcut bituminous concrete and underlying concrete (Longmeadow Street) pavement in the street and driveways, including all erosion control devices required to treat water runoff, shall be full compensation for all labor, equipment, and materials necessary for sawcutting bituminous concrete pavement shown on the Drawings and directed by the Engineer.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01310

COORDINATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Coordinate progress of the Work to minimize interference with the operation of the existing facilities and other utilities in the roadway.

2. Perform all coordination necessary to complete tie-ins to the existing water main.

B. Related Sections

1. Section 01325 – Scheduling of Construction

C. Related Work Not Included

1. Operation of existing facilities will be performed by the Owner unless otherwise specified. The Owner will assist in arranging operation of any existing valves and pipelines required by the Contractor to connect to existing pipelines, and no existing valves shall be operated without the Owner's knowledge.

1.2 SUBMITTALS

A. Submit to the Owner and Engineer all requests for temporary shutdowns of facilities or interruption of operations at least 7 days prior to the beginning of any shutdown. No shutdown shall occur without the approval of the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Owner will perform all operations of the existing water distribution system. Owner will assist in arranging operation of any existing facilities or equipment required by the Contractor to connect to existing facilities, and no existing equipment shall be operated without the Owner's knowledge.

B. Maintain existing facilities in operation unless otherwise specifically permitted in these Specifications or approved by the Owner.

C. Maintain suitable vehicular ingress/egress for motor vehicle at all existing homes for residents.

D. Perform all construction activities so as to avoid interference with operations of the facility and the work of others.

E. The Owner shall have the authority to order work stopped or prohibited, which would in his opinion, unreasonably result in stopping the necessary functions of the water distribution system. Any costs and/or delays associated with Owner authorized work stoppages due to the Contractor's operation shall be borne by the Contractor.

F. Owner and Engineer shall be kept fully informed at least one week before the beginning of all work by Contractor which may affect Owner's operations.

3.2 SEQUENCE OF CONSTRUCTION

A. Constructing the proposed improvements while maintaining existing operations will require a specific sequence of constructing portions of this project. The Contractor will be allowed as much flexibility as possible in scheduling the details of the project. The Contractor shall provide a detailed schedule as required in Section 01325.

B. The Contractor shall incorporate the following project scheduling requirements into development of the schedule submitted as required in Section 01325:

1. All components of the existing water distribution system must remain in operation throughout construction of the new water mains unless otherwise specified herein.

3.3 SHUTDOWNS

A. Water service shutdowns as a result of pipeline activities shall be minimized. In the event that an active main must be temporarily shut off, the Contractor shall submit a request to both the Engineer and the Assistant Director of Department of Public Works for Water and Sewer Operations at least three days prior to shut down. An existing main shall not be shut down unless authorized by the Owner. The Contractor shall notify the water system customers about any interruption in service at least three days in advance. An existing main shall not be shut off for more than 6 hours.

B. The Owner reserves the right to require rescheduling or reactivation of temporary shutdowns if an emergency occurs in the distribution system, such as a major pipeline break or fire.

END OF SECTION

SECTION 01325

SCHEDULING OF CONSTRUCTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Before starting work, Contractor shall submit to Engineer a Schedule of Operations and Construction within ten days after the date of the Notice to Proceed, any no later than one week before the start of construction. No work shall be started without approval of the schedule. When working on the project, Contractor must carry on his activities with full crews and in an efficient manner, so as to cause the minimum inconvenience to the public.

   a. The schedule shall reflect the proposed methods, the sequence of work, and the time of completion of various phases of the work within the completion time specified in the Contract.

   b. The schedule shall be detailed with daily activities and milestone completion dates.

   c. The schedule shall reflect the completion of all work including punch list work and clean-up.

   d. The work shall be rescheduled by Contractor if changes in the work scope alter the original schedule or he fails to comply with the original schedule. The revised schedule shall be submitted within 7 days of the receipt of Engineer's request.

   e. Contractor shall inform Engineer at least two weeks in advance of commencing work under this Contract.

2. Before starting work, Contractor shall submit to Engineer an estimate of rate of contract payments for the project on a monthly basis. If, in the opinion of Engineer, Contractor has deviated significantly from this projection during the course of the project, Contractor shall submit a revised rate of expenditure schedule to Engineer.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Product Data

2. Shop Drawings

3. Product Listing and Manufacturers Qualifications

4. Samples

5. Certificates of Compliance

1.2 SUBMITTALS

A. Product Data

1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing, and printed product warranties, as applicable to the Work.

B. Shop Drawings

1. Shop Drawings include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation drawings, schedule information, piece part drawings, actual shopwork manufacturing instructions, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certification, as applicable to the Work.

2. Submit Shop Drawings at the proper time so as to prevent delays in delivery of materials. Coordinate submittals for related or interdependent equipment; fragmented submittals will not be accepted for review by the Engineer. Advise the Engineer in writing of any deviations from the requirements of the Contract Documents.

3. Check all Shop Drawings regarding measurements, size of members, materials, and details to determine if they conform to the Contract Documents. Drawings found to be inaccurate, not in compliance, or otherwise in error shall be returned to the subcontractors for correction before submission to the Engineer. Drawings that are current shall be marked with the date, name, and approval stamp of the Contractor.

4. All details on Shop Drawings submitted for approval shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the Shop Drawings before being submitted for approval.

5. No material or equipment shall be purchased or fabricated until the required Shop Drawings have been submitted and approved. Materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by the Shop Drawings.

6. Until the necessary approval has been given, do not proceed with any portion of the work, the design or details of which are dependent upon the design or details of work, materials, equipment or other features for which approval is required.

7. The Engineer's review and approval of Shop Drawings shall not be construed as a complete check nor does it relieve the Contractor from responsibility for any departures or deviations from the requirements of the Contract Documents unless he has, in writing, called the Engineer's attention to such deviations at the time of submission. The Engineer's review of the shop drawings shall not relieve the Contractor from the responsibility for proper fitting of the Work, or the responsibility of furnishing any work required by the Contract Documents which may not be indicated on the Shop Drawings. The Contractor shall be solely responsible for any quantities shown on the Shop Drawings.

8. Should the Contractor submit for approval equipment that requires modifications to the structures, piping, layout, or other details shown on the Drawings, he shall also submit for approval details of the proposed modifications. If such equipment and modifications are approved, perform all work necessary to make such modifications at no additional cost to the Owner.

C. Product Listing And Manufacturers Qualifications

1. Within 7 calendar days after execution of the Notice to Proceed, submit to the Engineer the names and addresses of the manufacturers and suppliers of materials and equipment to be incorporated into the Work.

2. Within 30 days after Notice to Proceed, submit complete list of major products proposed for use, with specification section number, name of manufacturer, trade name, and model number of each product. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation and reference standards. Specifically identify the products, the anticipated schedule for delivery and storage, and the estimated value thereof for materials which the Contractor intends to request approval for off-site storage.

D. Contractor's Responsibilities

1. Review Shop Drawings, product data, and samples prior to submission and verify and determine:

a. Field measurements

b. Conformance with the Contract Documents. Advise the Engineer in writing of any deviations from the requirements of the Contract Documents.

2. Provide submittal identification and information including:

   The date of submission and dates of previous submissions, project title, Contractor identification, Specification section, manufacturer and supplier, identified field dimensions, applicable standards and identification of deviations from Contract Documents.

3. Provide 2 sets of submittals, 1 of which will be retained by the Engineer. A maximum of 3 sets will be returned by the Engineer with notations to the Contractor.

4. Apply the Contractor's stamp, initials, or signature certifying that the submission has been thoroughly reviewed for completeness, compliance with the Contract Documents, coordination with adjacent construction and dimensional compatibility. Items submitted without the stamp or that are incomplete will be returned by the Engineer for rework and resubmission.

5. Provide space for the Engineer's review stamps and comments. The Engineer will review Shop Drawings for design, general methods of construction and detailing.

6. Submissions shall be accompanied by a transmittal form referencing the project name and applicable Specification section. Submittals shall be referenced with consecutive numbering. Resubmittals shall bear the same transmittal number with a sequential letter suffix commencing with "A".

7. Revise and resubmit submittals as required, identify all changes made since last submittal.

8. Distribute copies of reviewed submittals to concerned parties with instructions to promptly report any inability to comply with the provisions or integrate the requirements with interfacing work.

1.3 REVIEW OF SHOP DRAWINGS

A. Submittals will be returned under one of the following codes:

1. APP – "Approved" is assigned when there are no notations or comments on the submittal. Equipment or materials may be released for manufacture.

2. AAN – "Approved as Noted" is assigned when there are notations or comments on the submittal, but the equipment or materials may still be released for manufacture. All notations and comments must be incorporated in the final product.

3. R&R – "Revise and Resubmit" is assigned when there are extensive notations and comments requiring a resubmittal of the package. It may also be assigned when there is a significant amount of missing material required for the Engineer to perform a complete review.

4. NA – "Not Approved" is assigned when the submittal does not meet the requirements of the Contract Documents. The entire package must be

resubmitted, revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the Contract Documents.

5. REV – "Reviewed – No Action Taken" is assigned to submittals that are reviewed but for which there is no approval required by the Engineer. Examples of the type of submittals that receive this stamp include, but are not limited to, design calculations stamped by another Professional Engineer and submittals of the Contractor's means and methods that have not been expressly specified.

1.4 QUALITY ASSURANCE

A. Certificates of Compliance

1. Provide sworn certificates from the manufacturer or material supplier that the materials and fabrications provided under the Specification section conform to the Contract Documents.

2. Submit Certificates of Compliance in triplicate.

3. Certificates shall be signed by an officer of the manufacturer's corporation and witnessed by a Notary Public.

1.5 SEQUENCING

A. General Procedures for Submission and Resubmission of Shop Drawings, Product Data, and Samples

1. Coordination

a. Prepare and submit documentation in advance of fabrication and product manufacturer, so that the installation will not be delayed, other related work can be properly coordinated, and there is adequate time for review and resubmission, if required.

b. No extension of time will be authorized due to failure to provide approvable submittals sufficiently in advance of the Work.

2. Resubmission

a. Make corrections and modifications required by the Engineer and resubmit until approved.

b. Clearly identify changes made to Shop Drawings and product data and indicate other changes that have been made other than those requested by the Engineer.

3. Distribution

a. Distribute approved Shop Drawings and approved product data to the Project Site and elsewhere as required to communicate the information to Suppliers, Subcontractors, and field personnel.

B. Samples will be retained by the Engineer on the Site.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01550

TRAFFIC CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Traffic requirements

2. Traffic officers

B. Payment

1. OWNER is responsible for paying for traffic officers, in the event they are required. CONTRACTOR is responsible for scheduling the traffic officers, with OWNER's approval, and for providing all documentation.

2. OWNER will deduct from monies due CONTRACTOR for the following abnormal and unreasonable expenses:

a. CONTRACTOR caused delays in the prosecution of work that result in hiring traffic officers for more hours than would have been required during normal prosecution of work.

b. Reconstruction and/or reinstallation of any portions of the work, as a result of improper initial installation, for which traffic officers are required.

c. Traffic officers required at a site where CONTRACTOR is not working or outside of CONTRACTOR's standard work day as a result of obstructions to traffic that remain in the traveled way.

d. All other incidents resulting from CONTRACTOR'S operations requiring traffic officers that would not normally be encountered during the progress of a well-organized project employing proper construction methods.

e. When traffic officers are requested for the convenience of CONTRACTOR and are not otherwise considered necessary to the work.

1.2 REFERENCES

A. Manual of Uniform Traffic Control Devices, U.S. Department of Transportation

1.3 TRAFFIC REQUIREMENTS

A. Arrange construction activity so that all streets shall remain open to at least one-way traffic during periods of actual work, and to unimpeded, two-way traffic during all other periods.

B. Provide a traffic control plan to ENGINEER for approval showing traffic control signs, barrels, cones, traffic officers, including detour signs, meeting the approval of ENGINEER, OWNER and local Police Department in accordance with the Manual of Uniform Traffic Control Devices.

C. Determine the location of each day's work and implement the approved traffic control plan. If the plan requires the use of traffic officers, notify the Police Department.

D. CONTRACTOR shall have no claim of delay if he does not notify the Police Department of his scheduled location in time to arrange for traffic officers.

E. Hand deliver written notice to individual houses affected by driveway and side road closings or detours a minimum 24 hours in advance. A recommended parking area outside the work limits shall be included in the notice.

1.4 TRAFFIC OFFICERS

A. Uniformed traffic officers shall be required at locations deemed necessary by OWNER, working in conjunction with local Police and Fire Departments, for the protection of the public.

B. The Police Chief or his representative, in consultation with OWNER's representative, will determine the number of officers required for the work.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01570

TEMPORARY EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Dust control

2. Drainage and erosion control

3. Haybales and siltation fence

B. Related Sections

1. Section 02920 – Lawns and Grasses

1.2 TEMPORARY DUST CONTROL

A. Exercise particular care to control dust both during and after construction. A mechanical street sweeper shall be used as needed.

B. Prevent dust from becoming a nuisance or hazard. During construction, excavated material and open or stripped areas are to be properly policed and controlled so as to prevent spreading of the material.

C. Control dust during and after construction using calcium chloride and/or salt. The Engineer may direct the Contractor to employ sprinkling of water in lieu of calcium chloride for dust control.

D. During and after construction, all paved road and driveway surfaces are to be scraped and broomed free of excavated materials on a daily basis. The surfaces are to be hosed down or otherwise treated to eliminate active or potential dust conditions and the natural road or wearing surface is to be exposed.

1.3 DRAINAGE AND EROSION CONTROL

A. Installed and maintain sediment trapping systems as required.

B. Discharge surface runoff from any disturbances to the site into silt containment basins. Siltation prevention measures utilizing haybale and geotextile fences for containment shall be taken before discharge to drainage systems.

C. Provide additional work if necessary to control erosion and siltation throughout the duration of construction activities.

PART 2 PRODUCTS

2.1 HAYBALES

A. Bales of hay required for siltation control shall be wire tied bales of the type normally used for siltation or erosion control or construction projects.

2.2 FILTER FABRIC

A. Filter fabric siltation fencing shall be a woven filter fabric having a weight of at least 2.5 ounces per square yard, a thickness of at least 17 mils, a coefficient of permeability of not less than 0.0009 centimeters per second and allows a water flow rate of a minimum 40 gallons per minute per square yard. The material shall have a high sediment filtration capacity, high slurry flow and minimum clogging characteristics. The material shall be equal to 100x as manufactured by Mirafi, Inc., Charlotte, North Carolina.

PART 3 EXECUTION

3.1 EXECUTION

A. Control of erosion and siltation during the construction is expected to require mulching, haybales, siltation fencing, diversion and control of storm water run-off, ponding areas and similar methods.

B. Place filtration fabric under catch basin grates.

C. Control surface waters within the construction area through the use of temporary culverts or other means.

D. Salvage existing loam and topsoil and stockpile this material for re-spreading where originally removed. On backfilling, grading shall be returned to preconstruction contours as much as possible and the stockpile of loam shall be spread over areas disturbed during construction activities.

E. Maintain the restored areas until such time as the Work is accepted by the Owner. Maintenance shall include all grading, refertilizing, reseeding, remulching and/or netting which may be necessary.

F. Seed shall be as specified under Section 02920.

3.2 CLEANING

A. Remove any sediment that builds up around the haybales or catchbasins.

B. Catchbasins that collect sediment as a result of the Work shall be thoroughly cleaned.

3.3 PAYMENT

A. All work associated with temporary erosion controls will not be separately paid for, but included under the general cost of the work, unless otherwise specified.

END OF SECTION

SECTION 01600

CONTROL OF MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Products and Material

2. Packaging, Handling and Storage of Materials

3. Inspection of Offsite Work

1.2 QUALITY ASSURANCE

A. Review all contract Drawings and Specifications with respect to specific system characteristics, applicability of materials and equipment for the intended purposes, sizes, orientation, and interface with other systems, both existing and proposed, and certify that the materials and equipment proposed will perform as specified prior to submitting shop drawings.

B. Provide sworn certificates as to quality and quantity of materials where specified or requested by the Engineer.

C. Obtain concurrence of the Engineer prior to processing, fabricating, or delivering material or equipment.

1.3 PRODUCTS AND MATERIAL

A. Use in the Work only new and first quality material, conforming to the requirements of these Specifications and approved by the Engineer. If, after trial, it is found that sources of supply that have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved materials from other approved sources.

B. Immediately remove defective materials and equipment from the site.

1.4 PACKAGING, HANDLING, AND STORAGE OF MATERIALS

A. Progressively deliver materials and equipment to the Site so there will be neither delay in progress of the Work nor an accumulation of material that is not to be used within a reasonable time.

B. Deliver products to the Site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.

2. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to the manufacturer, grade, quality, source, and other pertinent information.

C. Except as otherwise approved by the Engineer, determine and comply with the manufacturer's recommendations on product storage, handling, and protection.

Provide manufacturer's documentation on recommended storage procedures when requested by the Engineer.

D. Familiarize workmen and subcontractors with hazards associated with materials, equipment, and chemicals specified herein and take all necessary safety precautions.

E. Areas available on the construction site for storage of material and equipment is very limited. Any such proposed locations shall be approved in advance by the Engineer.

F. Store mechanical equipment subject to corrosive damage by the outdoor atmosphere (covered or not) in a heated, secured, insured commercial warehouse facility satisfactory to the Engineer. Equip drive motors with thermostatically controlled strip heaters.

G. Outdoor storage with plastic, canvas, plywood or other cover will not be allowed except where specific approval for designated items not containing electrical components or bearings is obtained from the Engineer.

H. No item judged rusty, corroded or otherwise damaged during storage will be accepted. Any electrical or instrumentation item determined by the Engineer to be damaged shall be removed from the Site and replaced by a completely new item in first class condition. Items not properly stored shall not be considered for any partial payment.

I. Do not store material or equipment in any wetland or environmentally sensitive area. Stockpile sites shall be level, devoid of mature stands of natural vegetation, and removed from drainage facilities and features, wetlands, and stream corridors.

J. Provide protective and preventive maintenance during storage consisting of manually exercising equipment where required, inspecting mechanical surfaces for signs of corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer as necessary for its protection and other precautions as necessary to assure proper protection of equipment stored.

K. Treat ferrous surfaces not receiving finish coats of paint with rust preventive coating, and protect non-ferrous metal work and devices with suitable wrappings.

1.5 INSPECTION OF OFFSITE WORK

A. Work to be done away from the construction site is subject to inspection on behalf of the Owner during its fabrication, manufacture, testing, or before shipment. Notify the Engineer of the place and time where such fabrication, manufacture, testing, or shipping is to be done. Such notice shall be in writing and delivered to the Engineer in ample time so that the necessary arrangements for the inspection can be made.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01630

PRODUCT SUBSTITUTION DURING CONSTRUCTION

1.1 SUMMARY

A. Section Includes

1. Procedures for requesting product, material or construction method substitution.

1.2 CONTRACTOR'S OPTIONS

A. For materials or equipment (hereinafter products) specified only by performance or reference standard, select product meeting that standard, by any manufacturer, fabricator, supplier or distributor (hereinafter manufacturer). To the maximum extent possible, provide products of the same generic kind from a single source.

B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which fully complies with the Drawings and Specifications.

C. For products specified by naming one or more products or manufacturers and stating "or equal", submit a request for a substitution of any product or manufacturer that is not specifically named.

D. For products specified by naming only one product or manufacturer and followed by words indicating that no substitution is permitted, there is no option and no substitution will be allowed.

E. Where more than one choice is available as a Contractor's option, select product that is compatible with other products already selected or specified.

1.3 SUBSTITUTIONS

A. If in the Engineer’s sole discretion, a product proposed by the Contractor is not functionally equal to that named and is not sufficiently similar so that no change in related Work will be required, it will not be considered a proposed substitute item.

B. During a period of 15 days after date of commencement of Contract Time, the Engineer will consider written requests from the Contractor for substitution of products or manufacturers, and construction methods (if specified).

1. After the end of specified period, request will be considered only in case of unavailability of product or other conditions beyond control of the Contractor.

C. Submit 2 copies of request for substitution. Submit separate request for each substitution. Include in request the following:

1. For products or manufacturers:

a. Product identification, including manufacturer's name and address.

b. Manufacturer's literature with product description, performance and test data, and reference standards.

c. Samples, if appropriate.

d. Name and address of similar projects on which product was used, and date of installation.

2. For construction methods (if specified):

a. Detailed description of proposed method.

b. Drawings illustrating method.

3. Such other data as the Engineer may require to determine that the proposed substitution is equal to the product, manufacturer or method specified.

D. In making request for substitution, the Contractor represents that:

1. The proposed substitution has been investigated, and determined that it is equal to or superior in all respects to the product, performance, manufacturer or method specified.

2. The same or better guarantees, warranties or bonds for proposed substitution as for product, manufacturer or method specified will be provided.

3. All claims for additional costs, either to the Contractor or Subcontractors, or extension of time related to proposed substitution will be waived.

E. A proposed substitution will not be accepted if:

1. Acceptance will require changes in the design concept or a substantial revision of the Contract Documents.

2. It will delay completion of the Work.

3. It is intended or implied on a Shop Drawing and is not accompanied by a formal request for substitution from the Contractor.

F. If the Engineer determines that a proposed substitute is not equal to that specified, the Contractor shall furnish the product, manufacturer or method specified at no additional cost to Owner.

G. Approval of a substitution will not relieve the Contractor from the requirement for submission of Shop Drawings as set forth in the Contract Documents.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01720

FIELD ENGINEERING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Establishment of lines, benchmarks, and elevations required to layout and construct the Work

2. Property line survey and delineation

1.2 SUBMITTALS

A. Submit the qualifications of the Registered Professional Engineer and/or Registered Land surveyor to be hired to perform various portions of the Work, if applicable.

B. Provide documentation verifying the accuracy of field engineering work.

C. Submit 2 copies of final record drawings of field engineering layouts and as-built survey.

1.3 RECORDS

A. Maintain a complete, accurate log of control and survey work as it progresses.

1.4 QUALITY ASSURANCE

A. Employ competent person skilled in construction staking and field measurement, as required for the particular characteristics of the work being performed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PROCEDURES

A. The competent employee in charge of field engineering/stakeout shall establish and maintain lines, elevations and reference marks needed during the progress of the Work and shall re-establish stakes and marks that are lost or destroyed through the course of the Work. Verify such work by instrument or other appropriate means.

B. The Engineer shall be permitted at all times to check the lines, elevations, and reference marks, set by the Contractor, who shall correct any errors disclosed by such check. Such a check shall not be construed to be an approval of the Contractor's work and shall not relieve or diminish the responsibility of the Contractor for the accurate and satisfactory construction and completion of the entire Work.

C. Make, check, and be responsible for measurements and dimensions necessary for the proper construction of and the prevention of misfittings in the Work.

D. Furnish all protective stakes and temporary structures for marking and maintaining points and lines for the building of the Work, and give the Engineer such facilities and materials for verifying said lines and points as he may require.

E. Revisions to the layout and elevations of the Work as defined by the Contract Documents shall be approved by the Engineer.

F. Maintain and prepare final record drawings of field engineering layouts and as-built survey conducted after completion of the Work.

G. All work associated with field engineering will not be paid for separately, but included in the general cost of the work.

END OF SECTION

SECTION 01725

PRESERVATION AND RESTORATION OF PROJECT FEATURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Protection and replacement of trees, shrubs, signs, property markers, fences, and related project features.

2. Taking precautions, providing programs, and taking actions necessary to protect public and private property and facilities.

1.2 DEFINITIONS

A. Underground Structures

1. Underground structures are defined to include, but not be limited to, sewer, water, gas, and other piping, and manholes, chambers, electrical and signal conduits, tunnels and other existing subsurface work located within or adjacent to the limits of the Work.

2. Underground structures known to the Engineer are shown on the Drawings to the extent that locations are available. This information is shown for the assistance of the Contractor in accordance with the best information available, but is not guaranteed to be correct or complete. The Contractor shall be responsible for checking on the actual locations of water, sewer, gas electric and telephone service connection lines to avoid potential interferences. The project site has not been surveyed.

B. Surface Structures

1. Surface structures are defined as existing buildings, structures and other facilities above the ground surface. Included with such structures are their foundations or any extension below the surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 REPAIR/RESTORATION

A. Trees, shrubs, and similar items shall not be removed except where necessary, as approved by the Engineer. Items to be removed shall be clearly marked as directed by the Engineer. If objects not to be removed are damaged or removed, they shall be repaired or replaced to their original condition.

B. Trees and shrubs on private property, which are removed or damaged by the Contractor shall be replaced in kind.

C. Signs, fences, property markers, walls, guard rails and other public or private property shall be replaced in kind if damaged. Supports and protective devices required shall be provided.

D. Underground and Surface Structures

1. In the event of damage, injury or loss to existing utilities and, whether shown on the Drawings or not, make all reasonable efforts to facilitate repairs and to mitigate the impact of such events upon the utility or structure owner's normal operations. Restore the existing utility or structure to the condition required by the owner of the utility or structure or at least to the condition found immediately prior to the Work. In the event that the utility owner elects to make the repairs, provide all reasonable access and assistance, and reimburse the utility owner for the cost of repairs. If utility service is interrupted due to damage to facilities, alternate facilities shall be provided.

2. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables, signs, poles, markers and curbs which are temporarily removed to facilitate the Work shall be replaced and restored to their original condition at the Contractor's expense unless otherwise indicated in other sections of these specifications.

3. Wherever water, sewer, gas or petroleum mains, electric or telephone lines, cables or other utilities and structures are encountered and may be in any way interfered with, inform the Engineer and the appropriate utility company. Cooperate with the Engineer and utility company in the protection, removal, relocation, and replacement of structures and facilities.

4. Prior to proceeding with any construction, notify in writing owners of utilities and structures within the vicinity of the proposed Work.

5. Work affecting water distribution systems, which will take fire hydrants out of service, must be coordinated with the local fire department. The Contractor shall be prepared to restore fire flows in the event of an emergency or to provide for temporary fire flow service in accordance with the requirements of the local fire department.

6. Materials used for relocation or replacement of utilities and structures shall be of an equivalent material, type, class, grade and construction as the existing or as approved by the respective owners thereof, unless otherwise shown or specified.

7. When any survey monument or property marker, whether of stone, concrete, wood or metal, is in the line of any trench or other construction work and may have to be removed, notify the Engineer in advance of removal. Under no circumstances shall any monument or marker be removed or disturbed by the Contractor or by any of his Subcontractors, employees or agents, without the permission of the Engineer. Monuments or markers removed or disturbed shall be reset by a land surveyor licensed in the State where the Work is located at the Contractor's expense. Should any monuments or markers be destroyed through accident, neglect or as a result of the Work under this Contract, the Contractor shall, at his own expense, employ a land surveyor licensed in the State where the Work is located to re-establish the monument or marker.

3.2 PROTECTION

A. The construction of certain portions of the project may require excavation within the root systems of trees. Roots with a diameter of 2 inches or more within the excavation shall not be cut. If necessary, excavation shall be made with small powered equipment or by hand to comply with this requirement. It may be necessary to excavate from more than one direction to avoid damage to the roots.

B. The trunks of trees that are to remain and are within the swing radius of the excavating machine bucket when fully extended shall be wrapped with burlap and 2–inch by 4-inch protective wood slats (8 inch spacing maximum) wired around the circumference of the trees to protect them from damage. No separate payment for this work will be provided, but included in the general cost of the work.

C. Tree limbs shall not be cut except upon written approval of the Owner and the Engineer. Tree limbs cut shall be painted with approved forestry paint manufactured specifically for that purpose.

D. Underground and Surface Structures

1. Sustain in their places and protect from direct or indirect injury underground and surface structures within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the work of sustaining and supporting such structure, satisfy the Engineer that the methods and procedures to be used have been approved by the party owning same.

2. Pay utility service company charges related to the temporary support of utility poles if required to complete the Work.

3. Assume risks associated with the presence of underground and surface structures within or adjacent to the limits of the Work. The Contractor shall be responsible for damage and expense for direct or indirect injury caused by his Work to any structure. Immediately repair damage caused by the Work to the satisfaction of the owner of the damaged structure.

END OF SECTION

SECTION 01770

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Documentation for Completed Work

2. Final Clean-up

1.2 SUBMITTALS

A. Closeout Submittals

1. The closeout submittals include but are not necessarily limited to

a. Evidence of payment and release of liens.

1.3 SEQUENCING

A. Substantial Completion

1. Prior to requesting final inspection and project close-out, the Contractor shall assure that the work is completed in accordance with the specified requirements and is ready for the requested inspection.

2. Within a reasonable period of time after receipt of the request, the Engineer will inspect the work to review compliance, completeness, and issue a listing of unsatisfactory work. The Contractor shall remedy the deficiencies and the work will be reinspected.

B. Completion

1. The Contract shall be considered complete and final payment made, only when:

a. All provisions of the Contract Documents have been strictly adhered to.

b. The project and premises have been left in good order, including removal of all temporary construction, Contractor-owned and extraneous materials as required.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 CLEANING

A. Where material or debris has washed, flowed or has been placed in existing watercourses, ditches, gutters, drains, pipe, or structures, for work done under the Contract work limits or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the Work, and the ditches, channels, drains, pipes, structures, and

watercourses shall, upon completion of the Work, be left in a clean and neat condition.

B. Restore or replace, when and as directed, any public or private property damaged or removed by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end, complete as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment and methods shall be used for such restoration. The restoration of existing property, signs or structures shall be done as promptly as practicable, as work progresses, and shall not be left until the end of the contract period.

END OF SECTION

SECTION 02221

REMOVAL OF EXISTING HYDRANTS AND GATE VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Removal of existing hydrants

2. Removal of existing gate valve boxes

3. Restoration of areas excavated for removal of hydrants and gate valve boxes

B. Related Sections

1. Section 02315 - Excavation, Backfill and Compaction

2. Section 02320 - Borrow Material

3. Section 02514 – Ductile Iron Pipe and Fittings

4. Section 02740 – Bituminous Concrete Pavement

5. Section 02920 – Lawns and Grasses

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of this work in the Section.

B. Use equipment of adequate size, capacity, and quantity to accomplish the work of this Section in a timely manner.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Removal of existing hydrant shall be performed only after the old water main have been deactivated and the new water main has been tested and disinfected and placed into service.

B. Existing hydrant shall be designated by the Owner to be either salvaged or disposed with.

C. In general, older existing hydrants shall be removed by approved methods and properly disposed of by the Contractor.

3.2 HYDRANT REMOVAL

A. The Contractor shall carefully remove from the ground each hydrant on the old water main to be abandoned. The hydrant shall be dug up and removed from the hydrant branch line by cutting or snapping off the branch line approximately 2 feet away from the base in a neat and workmanlike manner. Excavation and backfill shall be in accordance with Section 02315. Ground surface repairs including loam and seed and

pavement repair work shall be in accordance with Section 02740 and Section 02920 respectively. If subject to line pressure, the end of the old hydrant branch shall be mechanically capped or plugged in accordance with Section 02514. If not subject to line pressure, the end of the old hydrant branch shall be plugged with concrete.

B. Removal of hydrant gate boxes shall be in accordance with Part 3.3 below.

3.3 REMOVAL OF WATER MAIN VALVE BOXES

A. After the existing water main has been deactivated, the Contractor shall remove the top sections of all gate boxes, the holes filled in with an ordinary borrow or sand per Section 02320 and then patched with bituminous concrete in the area of the valve box in accordance with Section 02740.

3.4 DISPOSAL

A. All hydrants and valve boxes determined to be salvageable by the Owner or the Engineer shall be delivered to a site designated by the Owner. All non-salvageable hydrants and valve boxes shall be disposed of by the Contractor at no additional cost to the Owner.

END OF SECTION

SECTION 02315

EXCAVATION, BACKFILL, COMPACTION AND DEWATERING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Excavation, backfill and compaction for subsurface utilities

2. Removal, handling and disposal of rock not covered under Section 02410

3. Earth retention systems

4. Test pits

5. Temporary dewatering systems

B. Related Sections

1. Section 01570 – Temporary Erosion Controls

2. Section 02320 - Borrow Materials

3. Section 02740 – Bituminous Concrete and Gravel Road Repair

1.2 REFERENCES

A. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 [600 kN-m/m3]), Annual Book of ASTM Standards - Volume 04.08. - Soil and Rock

B. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method. Annual Book of ASTM Standards - Volume 04.08 - Soil and Rock

C. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). Annual Book of ASTM Standards - Volume 04.08 - Soil and Rock

D. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth), Annual Book of ASTM Standards - Volume 04.08. - Soil and Rock

E. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth), Annual Book of ASTM Standards - Volume 04.08. - Soil and Rock

F. 29 CFR Part 1926 Subpart P - OSHA Excavation Regulations 1926.560 through 1926.562 including Appendices A through F

1.3 DEFINITIONS

A. Benching - A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

B. Earth Retention Systems - Any structural system, such as sheeting and bracing or cofferdams, designed to retain in-situ soils in place and prevent the collapse of the sides of an excavation in order to protect employees and adjacent structures.

C. Excavation - Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

D. Protective System - A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include earth retention systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

E. Registered Professional Engineer - A person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

F. Shield System - A structure that is designed to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with 29 CFR 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

G. Sloping - A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

H. Temporary Dewatering System – A system to lower and control water to maintain stable, undisturbed subgrades at the lowest excavation levels. Dewatering shall be provided for all pipelines, structures and for all other miscellaneous excavations.

I. Trench - A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m).

1.4 SUBMITTALS

A. Drawings and calculations for each Earth Retention System required in the Work. The submittal shall be in sufficient detail to disclose the method of operation for each of the various stages of construction required for the completion of the Earth Retention Systems.

1. Submit calculations and drawings for Earth Retention Systems prepared, signed and stamped by a Professional Engineer registered in the state where the work is performed.

2. All Excavation, Trenching, and related Earth Retention Systems shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

B. Performance data for the compaction equipment to be utilized

C. Construction methods that will be utilized for the removal of rock

1.5 PROJECT CONDITIONS

A. Notify Dig Safe and obtain Dig Safe identification numbers.

B. Notify utility owners in reasonable advance of the work and request the utility owner to stake out on the ground surface the underground facilities and structures. Notify the Engineer in writing of any refusal or failure to stake out such underground utilities after reasonable notice.

C. Make explorations and Excavations to determine the location of existing underground structures, pipes, house connection services, and other underground facilities in accordance with Paragraph 3.2.D of this Section.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill material is subject to the approval of the Engineer and may be either material removed from excavations or borrow from off site. Fill material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, stable fill.

B. Satisfactory fill materials shall include materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, SW, and SP.

C. Satisfactory fill materials shall not contain trash, refuse, vegetation, masses of roots, individual roots more than 18 inches long or more than 1/2 inch in diameter, or stones over 6 inches in diameter. Organic matter shall not exceed minor quantities and shall be well distributed.

D. Satisfactory fill materials shall not contain frozen materials nor shall backfill be placed on frozen material.

E. Excavated surface and/or pavement materials such as gravel or trap rock that are salvaged may be used as a sub-grade material. In no case shall salvaged materials be substituted for the required gravel base.

2.2 DEWATERING MATERIALS

A. Provide haybales and silt fence in accordance with Section 01570.

B. Provide silt filter bags (Dandy Dewatering Bag, Dirtbag, JMP Environ-Protection Filter Bag, or equal) of adequate size to match flow rate.

PART 3 EXECUTION

3.1 PREPARATION

A. Public Safety and Convenience

1. Take precautions for preventing injuries to persons or damage to property in or about the Work.

2. Provide safe access for the Owner's representatives at site during construction.

3. Do not obstruct site drainage, natural watercourses or other provisions made for drainage.

3.2 CONSTRUCTION

A. Earth Retention Systems

1. Provide Earth Retention Systems necessary for safety of personnel and protection of the Work, adjacent work, utilities and structures.

2. Maintain Earth Retention Systems for the duration of the Work.

3. Systems shall be constructed using interlocking corner pieces at the four corners. Running sheet piles by at the corners, in lieu of fabricated corner pieces, will not be allowed.

4. Drive sheeting ahead of and below the advancing trench excavation to avoid loss of materials from below and from in front of the sheeting.

5. Sheeting is to be driven to at least the depth specified by the designer of the earth retention system, but no less than 2 feet below the bottom of the Excavation.

6. Remove sheeting, unless designated to be left in place, in a manner that will not endanger the construction or other structures. Backfill and properly compact all voids left or caused by the withdrawal of sheeting.

7. Remove earth retention systems, which have been designated by the Engineer to be left in place, to a depth of 3 feet below the established grade.

B. Excavation

1. Perform excavation to the lines and grades indicated on the Drawings. Backfill unauthorized over-excavation in accordance with the provisions of this Section, at no additional cost to the Owner.

2. Excavate with equipment selected to minimize damage to existing utilities or other facilities. Hand excavate as necessary to locate utilities or avoid damage.

3. Sawcut the existing pavement in the vicinity of the excavation prior to the start of excavation in paved areas, so as to prevent damage to the paving outside the requirements of construction.

4. During excavation, material satisfactory for backfill shall be stockpiled in an orderly manner at a distance from the sides of the excavation equal to at least one half the depth of the excavation, but in no case closer than 2 feet.

   a. Excavated material not required or not suitable for backfill shall be removed from the site.

   b. Perform grading to prevent surface water from flowing into the excavation.

   c. Pile excavated material in a manner that will endanger neither the safety of personnel in the trench nor the Work itself. Avoid obstructing sidewalks and driveways.

d. Hydrants under pressure, valve pit covers, valve boxes, manholes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the Work is completed.

5. Make pipe trenches as narrow as practicable and keep the sides of the trenches undisturbed until backfilling has been completed. Provide a clear distance of 12 inches on each side of the pipe.

6. The final 6 inches of excavation and grading of the trench bottom shall be performed by hand so as not to disturb the material below the grade required for setting the pipe or appurtenances.

   a. Where suitable bedding materials will be placed and compacted throughout the length of the trench, hand excavation of the final 6 inches will not be required.

   b. Grade the trench bottom to provide uniform bearing and support for the bottom quadrant of each section of pipe.

   c. Excavate bell holes at each joint to eliminate point bearing.

   d. Remove stones greater than 6 inches in any dimension from the bottom of the trench to avoid point bearing.

7. If satisfactory materials are not encountered at the design subgrade level, excavate unsatisfactory materials to the depth directed by the Engineer and properly dispose of the material. Backfill the resulting extra depth of excavation with satisfactory fill materials and compact in accordance with the provisions of this Section.

C. Backfill and Compaction

1. Unless otherwise specified or indicated on the Drawings, use satisfactory material removed during excavation for backfilling trenches. The Engineer may require stockpiling, drying, blending and reuse of materials from sources on the Project.

2. Spread and compact the material promptly after it has been deposited. When, in the Engineer's judgment, equipment is inadequate to spread and compact the material properly, reduce the rate of placing of the fill or employ additional equipment.

3. When excavated material is specified for backfill and there is an insufficient amount of this material at a particular location on the Project due to rejection of a portion thereof, consideration will be given to the use of excess material from one portion of the Project to make up the deficiency existing on other portions of the Project. Moving this excess material from one portion of the Project and placing it in another portion of the Project will be at no additional cost to the Owner.

   a. Use borrow material if there is no excess of excavated material available at other portions of the Project.

4. Backfilling and compaction methods shall attain 95% of maximum dry density at optimum moisture content as determined in accordance with ASTM D698, Method C.

5. Do not place stone or rock fragment larger than six inches in greatest dimension in the backfill.

6. Maximum loose lift height for backfilling existing or borrow material shall be 8 inches, unless satisfactory compaction is demonstrated otherwise to the Engineer through field-testing. In no case shall loose lift height for backfilling exceed 12 feet.

7. Do not drop large masses of backfill material into the trench endangering the pipe or adjacent utilities.

8. Install pipe in rock excavated trenches on a dense graded stone bedding with a minimum depth of 6 inches. Shape the stone bedding at the pipe bells to provide uniform support. Encase the pipe in the dense graded crushed stone bedding to a grade 6 inches over the top of the pipe and 12 inches on each side of the pipe.

9. Backfill from the bottom of the trench to the centerline of the pipe with the specified material. This initial backfill is to be placed in lifts of no more than 6 inches and thoroughly tamped under and around the pipe. This initial backfilling shall be deposited in the trench for its full width on both sides of the pipe, fittings and appurtenances simultaneously.

10. Electrical conduit not encased in concrete, shall be backfilled with sand borrow conforming to the requirements of Section 02320. The backfill shall be placed in the trench for its full width and shall extend to 12 inches over the pipe.

11. Where excavation is made through permanent pavements, curbs, paved driveways or paved sidewalks, or where such structures are undercut by the excavation, place the entire backfill to sub-grade with granular materials and compact in 6 inch lifts. Use approved mechanical tampers for the full depth of the trench. If required, sprinkle the backfill material with water before tamping so as to improve compaction.

12. Place and compact backfill around manholes, vaults, pumping stations, gate boxes or other structures in six inch layers, from a point 1 foot over the pipe. Exercise care to protect and prevent damage to the structures.

13. Install impervious trench dams where stone borrow is used for pipe bedding to prevent groundwater from following along the stone bedding. Install dams every 100 feet.

D. Test Pit Excavation

1. Excavate test pits at locations as are indicated on the Drawings, as necessary, or as required by the Engineer. Test pits are required to locate underground facilities whose location, depth or size are not precisely known and are critical to the Work. Brace, sheet, and pump test pit excavations for safe excavation and examination of the structure or utility to be exposed.

2. Determine the material and construction characteristics of the existing pipeline exposed during the test pit excavation.

3. Measure the depth to the top of each pipe and utility, from the ground surface, at each test pit location.

4. Clear the site, excavate and backfill all test pits. Cut and remove roadway surfaces; remove cement, concrete and bituminous concrete sidewalks; remove, handle, rehandle, backfill and dispose of materials encountered within the limits of the Work.

5. Conduct all subsurface investigations in accordance 29 CFR Part 1926 Subpart P – OSHA Excavation Regulations 1926.560 through 1926.562 including Appendices A through F.

6. Upon completion of the examination by the Engineer backfill and compact the test pits in accordance with this Section.

7. Repair paved surfaces in accordance with Section 02740.

E. Dewatering

1. Provide, operate and maintain adequate pumping, diversion and drainage facilities to maintain the excavated area sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures nor cause excessive disturbance of underlying natural ground. Locate dewatering system components so that they do not interfere with construction under this or other contracts.

2. Take actions necessary to ensure that dewatering discharges comply with permits applicable to the Project. Dispose of water from the trenches and excavations in such a manner as to avoid public nuisance, injury to public health or the environment, damage or public or private property, or damage to public or private property, or damage to the work completed or in progress.

3. Repair any damage resulting from the failure of the dewatering operations and any damage resulting from the failure to maintain all the areas of work in a suitable dry condition, at no additional cost to the Owner.

4. Exercise care to ensure that water does not collect in the bell or collar holes to sufficient depth to wet the bell or collar of pipes waiting to be jointed.

5. Take precautions to protect new work from flooding during storms or from other causes. Control the grading in the areas surrounding all excavations so that the surface of the ground will be properly sloped to prevent water from running into the excavated area. Where required, provide temporary ditches for drainage. Upon completion of the work, all areas shall be restored to original condition.

6. Brace or otherwise protect pipelines and structures not stable against uplift during construction.

7. Do not excavate until the dewatering system is operational and the excavation may proceed without disturbance to the final subgrade.

8. Unless otherwise specified, continue dewatering uninterrupted until the structures, pipes, and appurtenances to be installed have been completed such that they will not float or be otherwise damaged by an increase in groundwater elevation.

9. If open pumping from sumps and ditches results in "boils", loss of fines, or softening of the ground, submit a dewatering plan to the Engineer within 48 hours. Implement the approved modified plan and repair any damage incurred at no additional cost to the Owner.

10. Where subgrade materials are unable to meet the subgrade density requirements due to improper dewatering techniques, remove and replace the materials in accordance with Section 02320 at no additional cost to the Owner.

11. Notify the Engineer immediately if any settlement or movement is detected of survey points adjacent to excavations being dewatered. If settlement is deemed by the Engineer to be related to the dewatering, submit a modified dewatering plan to the Engineer within 24 hours. Implement the approved modified plan and repair any damage incurred to the adjacent structure at no additional cost to the Owner.

12. Dewatering discharge:

    a. Install sand and gravel filters in conjunction with well points and deep wells to prevent the migration of fines from the existing soil during the dewatering operation.

    b. Do not discharge water into any sanitary sewer system.

    c. Provide separately controllable pumping lines.

    d. The Engineer reserves the right to sample discharge water at any time.

13. Removal

    a. Do not remove dewatering system without written approval from the Engineer.

    b. Backfill and compact sumps or ditches with screened gravel or crushed rock in accordance with Section 02320.

    c. Remove well points and deep wells. Backfill abandoned well holes with cement grout having a water cement ratio of 1 to 1 by volume.

END OF SECTION

SECTION 02317

UNDERGROUND WARNING TAPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Underground Warning Tape

1.2 SUBMITTALS

A. Shop Drawing Submittals

1. Product Data

PART 2 PRODUCTS

2.1 MATERIALS

A. Metallic warning tape for underground piping shall be polyethylene tape with metallic core for easy detection and location of piping with a metal detector.

B. Tape shall be colored and printed with the words per the nature of the specific pipeline.

C. Tape shall be 6 inches wide.

D. Tape shall be as manufactured by Seton Name Plate Corp., New Haven, CT; Presco Detectable Underground Warning tape, Sherman, Texas; Blackburn Manufacturing, Neligh, NE; Mercotape, Hachensach, NJ; or approved equal.

E. The warning tape shall be heavy gauge 0.004 inch polyethylene and shall be resistant to acids, alkalis and other soil components. It shall be highly visible in the following color with the associated phrases stamped in black letters and repeated at a maximum interval of 40 inches.

Type of Utility		WARNING MESSAGE
Water	Blue	CAUTION – WATER LINE BURIED BELOW

F. The tape shall be of the type specifically manufactured for marking and locating utilities.

PART 3 EXECUTION

3.1 INSTALLATION

A. All buried pipe and fittings shall be installed with metallic-lined underground warning tape located approximately 18 inches below grade to allow detection by a metal detector.

END OF SECTION

SECTION 02320

BORROW MATERIALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Gravel Borrow
2. Processed Gravel Borrow for Pavement Sub-base
3. Stone Borrow
4. Ordinary Borrow

1.2 REFERENCES

A. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

B. ASTM C117 - Standard Test Method for Materials Finer than 75 µm (No. 200) Sieve in Mineral Aggregates by Washing

C. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ft-lbf/ft^3)

D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

E. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb./ft^3)

F. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)

G. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

H. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

I. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

J. AASHTO – Standard Specification for Transportation Materials and Methods of Sampling and Testing, 1986 Edition as amended

K. Commonwealth of Massachusetts Department of Public Works “Standard Specification for Highways and Bridges”, 1988 Edition as amended

1.3 SUBMITTALS

A. Representative Samples of borrow materials taken from the source. Tag, label, and package the Samples as requested by Engineer. Provide access to the borrow site for field evaluation and inspection.

B. Provide sieve analysis (ASTM C136) and permeability analysis (ASTM D2434) from certified soils testing laboratory for all borrow materials. Take and test a sample, at no additional cost to the Owner for each 1,500 c.y. of borrow material placed.

C. Provide standard proctor analysis (ASTM D698) from certified soils testing laboratory for all borrow materials.

1.4 QUALITY ASSURANCE

A. No borrow shall be placed prior to the approval of Samples by the Engineer.

1.5 PROJECT/SITE CONDITIONS

A. Existing Conditions

1. Comply with any environmental requirements and restrictions.

2. Keep all public and private roadway surfaces clean during hauling operations and promptly and thoroughly remove any borrow or other debris that may be brought upon the surface before it becomes compacted by traffic. Frequently clean and keep clean the wheels of all vehicles used for hauling to avoid bringing any dirt upon the paved surfaces.

PART 2 PRODUCTS

2.1 ORDINARY BORROW

A. Ordinary Gravel borrow shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50. The intent of this project is to reuse as much existing material on site as possible.

Ordinary Borrow shall comply with Section M1.01.0 of the MASSDOT Standard Specifications for Highways and Bridges.

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2.2 GRAVEL BORROW

A. The compacted gravel borrow to be used for pavement subbase shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50. Gravel Borrow shall also conform to Section M1.03.0 of the MASSDOT Standard Specifications for Highways and Bridges.

PART 3 EXECUTION

3.1 INSTALLATION

A. Prior to the placement of borrow material, site preparation shall be completed as required by the Contract Documents, and approved by the Engineer.

B. Ensure that all materials are properly stockpiled on site to prevent contamination by other materials.

C. Place borrow material over the entire area in uniform lifts and compact to 95% of maximum dry density.

D. Utilize stockpiled borrow prior to using off-site borrow.

E. Utilize gravel borrow in all locations where a surface treatment has not been specified but requires a firm finish surface.

F. Processed gravel for pavement subbase is intended to provide a stable foundation for driveways, sidewalk and roadway repair where a gravel base has been specified.

G. Borrow shall be used as a replacement for unsuitable materials where poor soil conditions below the invert or subbase depth of the trench are encountered during the progress of the work. Extra excavation and the type of borrow, as determined by Engineer, shall be used only in those locations where its use is ordered by Engineer. The intent of the borrow is to provide a stable foundation for the pipe as a replacement of unsatisfactory material, not as an aid to dewatering trenches. Its use shall be limited to those areas in which Engineer orders its use in writing.

H. Shape borrow used for pipe foundation material so that it supports the pipe properly and will not damage the pipe, bells, collars, or the pipe fittings.

I. Place all borrow to keep it free of other materials and to prevent segregation.

END OF SECTION

SECTION 02501

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Procedures for disinfecting new and repaired water distribution systems.

B. Related Sections

1. Section 02502 – Testing of Water Distribution Systems
2. Section 02513 – Copper Pipe and Fittings
3. Section 02514 – Ductile Iron Pipe and Fittings
4. Section 02518 – Valves and Hydrants
5. Section 02519 – Water Services

1.2 REFERENCES

A. American Water Works Association, AWWA C651, *AWWA Standard for Disinfecting Water Mains.*

B. American Public Health Association, American Water Works Association and Water Pollution Control Federation, *Standard Methods for the Examination of Water and Wastewater.*

1.3 SUBMITTALS

A. A formal statement in writing to the Engineer that all crews responsible for installation and repairs within the distribution system have been properly trained and are aware of prescribed construction practices and disinfection procedures to avoid contamination to the distribution system.

B. The name of competent person(s) responsible for the disinfection processes and performing the required bacteriological sampling. The Engineer shall approve the procedure in advance.

C. Certificate of compliance that the independent commercial laboratory performing the bacteriological sampling analyses is certified with the State Department of Environmental Protection and U.S. Environmental Protection Agency for analyzing public drinking water supplies.

D. Certified results for all bacteriological sampling prior to restoring or placing the distribution system into service.

E. For each section of pipe to be chlorinated, the Contractor shall inform the Engineer in writing of the locations for taps to be installed and utilized for the procedure.

1.4 QUALITY ASSURANCE

A. Qualifications & Certifications

1. The Contractor shall employ trained personnel aware of the need to carefully observe prescribed construction practices and disinfection procedures in order to prevent contamination to the distribution system.

2. The competent person(s) responsible for the disinfection processes and bacteriological sampling shall be familiar with AWWA C651- Standards for Disinfecting Water Mains and experienced with the Continuous Feed Method of disinfection. The Engineer shall approve disinfection procedures in advance.

3. Bacteriological sampling shall be made in full accordance with AWWA C651 and under the supervision of the Engineer.

4. An independent commercial laboratory certified for analyzing public drinking water supplies by the State Department of Environmental Protection and U.S. Environmental Protection Agency shall analyze all bacteriological samples and provide certified results to the Engineer and/or Owner for review prior to restoring or placing the system into service.

1.5 PROJECT/SITE CONDITIONS

A. The general procedure for disinfection and analyses is described in PART 3 – EXECUTION of this section. If project conditions warrant the need for special disinfection procedures the Contractor must obtain prior written approval from the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A. The forms of chlorine used in the disinfection operations shall conform to ANSI/AWWA B300. Materials Safety Data Sheets (MSDS) for the disinfectant shall be readily available for reference. The competent person responsible for the disinfection operation shall be fully trained and equipped to handle any emergency that may arise.

PART 3 EXECUTION

3.1 DISINFECTION

A. Before being placed into service, all new water pipelines shall be chlorinated using the Continuous Feed Method specified in AWWA C651. The Engineer shall approve the procedure in advance.

1. The Contractor will determine the location of the chlorination and sampling points in the field. The Contractor shall install taps for chlorinating, sampling and expulsion of air and shall uncover, backfill and plug the taps as required.

2. Prior to disinfecting the water main, the main shall be completely filled to remove all air pockets and then flushed to remove particulate. The flushing velocity in the main shall not be less than 2.5 ft/s unless the Engineer and/or Owner determine that the conditions do not permit the required flow to be discharged to waste.

Table 3.1-1 Required flow to flush pipelines (40 psi residual pressure in water main)*

Pipe Diameter (in)	Flow Required to Produce 2.5 ft/s (Approximate velocity in main)
4	100 gpm
6	200 gpm
8	400 gpm
10	600 gpm
12	900 gpm
16	1600 gpm

**AWWA C651, AWWA Standard for Disinfecting Water Mains.*

3. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will not have less than 25 mg/L (PPM) free chlorine throughout the entire section of pipe to be chlorinated.

Table 3.1-2 Chlorine required to produce 25-mg/L concentration in 100 feet of pipe – by diameter. *

Pipe Diameter (inches)	100 % Chlorine (Pounds)	1% Chlorine Solution (Gals.)
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
16	0.217	2.60

**AWWA C651, AWWA Standard for Disinfecting Water Mains.*

4. The chlorinated water is to remain in the new pipeline for at least 24-Hours. After a contact time of 24-Hours there should be a free chlorine concentration of not less than 10 mg/L (PPM). During this period, proper precautions are to be taken to prevent this chlorinated water from flowing back into the existing system.

5. All valves and hydrants within the treated section shall be operated to ensure disinfection of the appurtenances.

B. The Tablet Method consisting of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water and allowing it to set for a contact period is not acceptable.

C. The interior of all pipe, fittings and valves used in making a repair or tie-in shall be swabbed or sprayed with a one percent (1%) hypochlorite solution before they are installed.

3.2 FINAL FLUSHING

A. Following the chlorination period, all treated water shall be flushed from the lines at their extremities and replaced with water from the distribution system.

1. Flushing the main is to be accomplished at as high a velocity as possible consistent with the ability of the Contractor to collect the discharge water for proper disposal.

2. All treated water flushed from the lines shall be disposed of by discharging to the nearest sanitary sewer or by other approved means provided in AWWA C651.

3. Flushing shall be done in strict conformance with all applicable local, state and federal regulations. No discharge of chlorinated water to any storm sewer or natural watercourse will be allowed.

3.3 BACTERIOLOGICAL ANALYSES

A. After the 24-Hour disinfection period and all chlorine solution has been thoroughly flushed the bacteriological sampling and analysis of the replacement water may then be performed.

1. Bacteriological sampling shall be made by the Contractor's competent person(s) in full accordance with AWWA C651- Section 7, *Bacteriological Tests* and under the supervision of the Engineer.

2. Analysis shall be performed by an independent commercial laboratory certified by the State Department of Environmental Protection and U.S. Environmental Protection Agency for analyzing public drinking water supplies. All results shall be provided to the Engineer for review.

3. Two consecutive sets of acceptable samples, taken at least 24-Hours apart are required prior to placing the main into service. Failure of any one of the bacteriological test samples shall require rechlorination and retesting by the Contractor.

4. The line shall not be placed in service until the bacteriological requirements of AWWA C651 are met.

END OF SECTION

SECTION 02502

TESTING OF WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Testing of pipe, castings, fittings, valves and accessories.

1.2 REFERENCES

A. American Water Works Association, AWWA C600, AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. American Water Works Association, AWWA C605, Underground installation of Polyvinyl Chloride (PVC) Pressure Pipe & Fittings for Water.

1.3 SUBMITTALS

A. List of equipment and personnel to be used for the pressure test.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 TESTS REQUIRED

A. On completion of the pipeline, fill pipeline with water and test. Draw water from the existing water system under the direction of the Engineer and the Water Department.

B. Run pressure test and leakage test simultaneously in accordance with ANSI/AWWA C600. Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. Test pressure shall not exceed pipe or thrust-restraint design pressures. The hydrostatic test shall be of at least 2-hour duration or until such time as the Engineer indicates acceptance of the pipeline. Test pressure shall not vary by more than ±5 psi (35 MPa or 0.35 bar) for the duration of the test.

C. On pipelines where the elevation along the route of construction varies substantially, the Engineer reserves the right to valve off and test portions of the line.

D. On extensive construction jobs, the Engineer reserves the right to require the testing of individual portions of the line as construction proceeds rather than await completion of the entire project in order to undertake a pressure or leakage test.

E. Do not operate valves in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

F. Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

3.2 TIME FOR MAKING TESTS

A. No pipeline is to be placed under pressure or subjected to hydrostatic pressure until at least 5 days have elapsed after the concrete thrust blocks have been installed. If high early strength concrete is used in the concrete thrust blocks, the hydrostatic pressure can be applied to the main after 2 days have elapsed from time of construction of the thrust blocks.

B. The Contractor will be allowed to complete backfilling as hereinbefore specified, prior to undertaking the leakage and pressure tests. Backfilling prior to conducting tests will be at the option of the Contractor with the exception of intersections, driveways, crosswalks and other such locations where holding open the trench may adversely affect the public.

C. Pipelines may be subjected to hydrostatic pressure and inspected for leakage at any convenient time after the trench has been partially backfilled. Partial backfilling shall consist of filling along the center of the pipe length and leaving the joint open for inspection.

3.3 PROCEDURE

A. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.25 times the working pressure at the point of testing. Slowly fill each valved section of pipe with water, and apply the specified test pressure, based on the elevation of the highest point of the line or section under test and corrected to the elevation of the test gauge by means of a pump connected to the pipe in a manner satisfactory to the Engineer. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The system shall be stabilized at the test pressure before conducting the leakage test.

B. Do not operate any valve or other control device on the existing water system for any purpose. Do not make any tap or cut-in to the existing water system without the approval of the Engineer and unless an authorized representative of the Owner is present.

C. When the Contractor's operations require the adjustment of any hydrant, valves, or other control device on the existing system, the Owner will provide authorized personnel for the purpose of supervising the operation of these control devices. Provide the personnel for the operation of these devices.

D. Conduct connections to the existing system under the direction of the Owner's Project Representative.

E. To allow for proper filling, venting, testing, etc., install any corporation stops and/or special fittings which may be required. All such installation will be subject to the approval of the Owner's Project Representative.

F. Foreign materials left in pipelines during installation often results in valve or hydrant seat leakage during pressure tests. Thorough flushing is recommended prior to a pressure test by partially opening and closing valves and hydrants several times under

expected line pressure, with flow velocities adequate to flush foreign material out of the main, valves and hydrants.

G. Before applying the specified test pressure, expell air completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, close the corporation cocks and apply the test pressure. At the conclusion of the pressure test, either remove and plug or leave in place the corporation cocks at the discretion of the Owner.

3.4 EXAMINATION UNDER PRESSURE

A. Examine exposed pipes, fittings, valves, hydrants, and joints carefully during the test.

B. Repair or replace any cracked or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure tests with sound material, and repeat the test until it is satisfactory to the Engineer.

3.5 LEAKAGE TEST

A. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof to maintain pressure after the pipe has been filled with water and the air has been expelled. Testing shall include all hydrants and hydrant branches. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

B. No pipe installation will be accepted if the leakage is greater than that determined by the following formula; or greater than 10 gallons/in dia./mile of pipe/24 hours, whichever is less:

$$L = \frac{SD\sqrt{P}}{133,200}$$

Where:
- L = allowable leakage, in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the leakage test, in pounds per square inch (gauge)

This formula is based on an allowable leakage of 11.65 gpd/mi/in of nominal diameter at a pressure of 150 psi.

C. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. of nominal valve size will be allowed.

D. When hydrants are in the test section, the test shall be made against the closed main valve in the hydrant.

E. Acceptance of Installation - acceptance will be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in this section, locate and make approved repairs as necessary until the leakage is within the specified allowance at no additional cost to the Owner.

F. Visible leaks are to be repaired, regardless of the amount of leakage.

END OF SECTION

SECTION 02513

COPPER PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Buried copper piping for:

a. Domestic Water Services

B. Related Sections

1. Section 02501 – Disinfection of Water Distribution System

2. Section 02502 – Testing of Water Distribution System

3. Section 02519 – Water Services

1.2 REFERENCES

A. 248 CMR 2.00 – Uniform State (Massachusetts) Plumbing Code

B. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings

C. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

D. ASME B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes

E. ASTM B32 – Standard Specification for Solder Metal

F. ASTM B68 – Standard Specification for Seamless Copper Tube, Bright Annealed

G. ASTM B75 – Standard Specification for Seamless Copper Tube

H. ASTM B88 – Standard Specification for Seamless Copper Water Tube

I. ASTM B306 – Standard Specification for Copper Drainage Tube (DWV)

J. NSF/ANSI Standard 61 – Drinking Water System Components

K. Underwriters Laboratories

1.3 SUBMITTALS

A. Shop Drawings

1. Shop Drawings shall consist of manufacturer's scale drawings, catalog cuts including descriptive literature and complete characteristics and specifications, as well as code requirements.

2. Shop drawings shall be submitted for the copper tubing, type of joint, fittings, and couplings, in accordance with these specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Pipe and tube to be cleaned and capped and delivered to the job site with factory applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipe and tube from moisture and dirt. Elevate above grade.

C. Protect fittings and pipe specialties from moisture and dirt.

PART 2 PRODUCTS

2.1 MATERIALS

A. Copper Tubing

1. Copper tubing for water services shall conform to ASTM specifications B75, B88, and B68 as they apply to Type K copper tubing.

2. Underground Water Distribution Piping systems

a. Fittings - ASME B16.18, ASME B16.22, ASME B16.26.

b. Joints - Brazed or flared (ASTM B32 Alloy Sn50 shall not be used).

c. Shall comply with the requirements of NSF/ANSI 61.

PART 3 EXECUTION

3.1 INSTALLATION

A. Water Piping

1. Install copper tubing for domestic water services as specified and in accordance with the manufacturer's instructions.

2. Provide couplings as required to connect new copper tubing to existing service pipe.

3. The copper tubing shall be installed with a minimum of 5'-0" of cover, unless specifically indicated otherwise on the Drawings or as directed by the Owner's project representative.

3.2 DISINFECTION

A. Refer to Section 02501 – Disinfection of Water Distribution System.

3.3 TESTING

A. Refer to Section 02502 – Testing of Water Distribution System.

END OF SECTION

SECTION 02514

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. Ductile iron pipe and fittings

2. Caps, plugs, thrust blocks and other materials to deactivate and abandon existing pipelines

B. Related Sections

1. Section 02315 – Excavation, Backfill, Compaction and Dewatering

2. Section 02317 – Underground Warning Tape

3. Section 02501 – Disinfection of Water Distribution Systems

4. Section 02502 – Testing of Water Distribution Systems

1.2 REFERENCES

A. Pipe and fittings shall conform to the latest edition of the following standards unless otherwise specified:

1. ANSI/AWWA C104/A21.4, Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.

2. ANSI/AWWA C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems.

3. ANSI/AWWA C110/A21.10, Ductile Iron and Grey Iron Fittings 3″ through 48″ for Water and Other Liquids.

4. ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

5. ANSI/AWWA C115/A21.15, Flanged Ductile Iron Pipe with Ductile Iron or Gray-Iron Threaded Flanges.

6. ANSI/AWWA C150/A21.50, Thickness Design of Ductile Iron Pipe.

7. ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast, for Water.

8. ANSI/AWWA-C153/A21.53, Ductile Iron Compact Fittings Water Service.

9. ANSI/AWWA C600, Installation of Ductile Iron Water Mains and their Appurtenances.

10. ANSI/AWWA C800, Underground Service Line Valves and Fittings.

11. ANSI/AWWA C651, Disinfecting Water Mains.

12. ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

13. ASTM B88, Standard Specification for Seamless Copper Water Tube.

14. ASTM D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

15. Ductile Iron Pipe Research Association, "Thrust Restraint Design for Ductile Iron Pipe" (Third Edition).

1.3 SUBMITTALS

A. Administrative Submittals

1. Detailed description of proposed pipe handling and installation methods along with the manufacturer's approval.

2. Construction details and schedule of operation for each connection to existing piping at least 30 days prior to beginning work. Approval must be received before commencement of work.

B. Shop Drawings

1. Manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications and code requirements. Submit shop drawings for ductile iron pipe, types of joint, fittings, couplings, filling rings, lining and coating.

2. Additional requirements for restrained joints:

a. Pipe layout drawings showing both plan and profile of the proposed pipeline. Include curve and deflection data, invert elevations, grades, joint locations, closure locations, joint openings if any, and other necessary information.

b. Locations and type of restrained joints or devices to prevent joint separation.

C. Quality Control Submittals

1. Certificates of Compliance on pipe materials.

2. Prior to first shipment of pipe, submit certified test reports that the pipe for this Contract was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

3. Manufacturers of pipe on the project shall have an established, annually audited and certified, quality control procedure for manufacturing of pipe. Each manufacturer shall be certified by an independent, third party auditor for compliance with all requirements of the AWWA standards. The manufacturer shall submit a current certificate of compliance for the plant facility where the pipe is to be made. Certificate of compliance shall be submitted for each additional year of pipe manufacturing during the duration of the Project. The manufacturer shall not change the plant manufacturing the pipe during the duration of the Project without the written authorization of the Engineer.

1.4 QUALITY ASSURANCE

A. Pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. In addition, the Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests will be at the Owner's expense.

B. Ductile iron pipe shall be from a single manufacturer. Fittings shall be from a single manufacturer, not necessarily the pipe manufacturer.

C. Shop Inspection - Materials are subject to inspection and approval at the plant of the manufacturer. Except where specified otherwise, inspection will be carried out by the Engineer and will be carried out at no direct expense to the Contractor.

D. The Engineer will inspect the pipe and fittings after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements. Pipe rejected after delivery, or at any point during the progress of the work, shall be marked for identification and shall immediately be removed from the job site at no additional cost to the Owner.

E. Pipe shall be laid, jointed and tested under pressure for defects and leakage in the manner hereinafter specified.

F. All pipe and fittings shall be manufactured in North America.

1.5 PROJECT CONDITIONS

A. Secure permits and pay fees required to carry out the piping work. The Contractor shall comply with laws, ordinances, codes, rules, and regulations of the local and state authorities having jurisdiction over the Work. Where provisions of the Contract are in conflict with the codes, the code shall govern requirements set forth in this Section and indicated on the Drawings. The Contract Documents shall govern when in excess of the required or minimum regulations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

1. American Cast Iron Pipe Company
2. Griffin Pipe Products
3. U.S. Pipe
4. or Approved Equal.

2.2 PIPE

A. Ductile iron pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151. Fittings and other materials referenced in this section shall conform to the latest edition of the references listed in Paragraph 1.2 of this section.

B. Unless otherwise indicated or specified, direct buried ductile iron pipe shall be Class 52.

C. The manufacturer shall provide sufficient gauged pipe sections to the Contractor in accordance with AWWA C151 to ensure the availability of each pipe diameter required on the project.

2.3 PIPE JOINTS

A. Direct buried ductile iron pipe shall use push-on-joints conforming to ANSI/AWWA C111/A21.11. Mechanical joints conforming to ANSI/ AWWA C111/A21.11 may also be utilized, where shown on the Drawings or approved by the Engineer.

B. Where shown on the Drawings, restrained joints shall be used and shall be suitable for a 150 psi working pressure and fabricated of heavy section cast iron casting. Gaskets shall meet the material requirements of ANSI/AWWA A21.11/C111 for mechanical joint gaskets. Bolts and nuts as required shall be low carbon steel conforming to ASTM A307, Grade B. Restrained joints for rubber-type push-on joint pipe shall be Lok-Ring Joint by American Cast Iron Pipe Company, TR FLEX by US Pipe and Foundry Co., Snap-Lok by Griffin Pipe Products Co., or approved equal.

C. Restrained joints may be used in lieu of concrete thrust blocks for restraining pipe.

2.4 FITTINGS

A. Fittings shall be ductile iron or gray iron. Pipe fittings for below ground service shall be mechanical joint, unless noted otherwise on the Drawings or approved by the Engineer.

1. Fittings less than or equal to 12 inches in size shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have a 350 psi pressure rating.

2. Fittings greater than 12 inches in size shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have the following pressure ratings:

a. Fittings greater than 12 inches and less than or equal to 24 inches - 350 psi

b. Fittings greater than 24 inches - 250 psi

B. Pipe and fittings, except where specified, shall have a bituminous outside coating in accordance with AWWA C151 and C110 or C153, as applicable.

C. Pipe and fittings shall be cement-mortar lined and seal coated on the interior in accordance with AWWA C104. Cement mortar lining shall be <u>twice</u> the standard thickness; tolerance shall be minus 0 inches, plus 1/8 inch.

D. Mechanical joint retainer glands shall be installed on all mechanical joints, except where rodding is used. Retainer glands shall be specifically designed to fit standard mechanical joint bells with corrosion resistant, low-alloy T-head bolts conforming to ANSI/AWWA A21.11/C-111 and ANSI/AWWA A21.53/C-153. Retainer glands shall be manufactured of ductile iron conforming to ASTM A536-80 grade 60-42-10. Set screws shall be of hardened ductile iron and require the same torque in all sizes. Steel set-screws are not permitted. These devices shall have a minimum 250 psi pressure rating with a minimum safety factor of 2:1 and shall be EBAA IRON, Inc., series 1100 or approved equal. Glands shall be listed with Underwriters Laboratories

and/or approved by Factory Mutual. Concrete thrust blocks are required to be used in conjunction with retainer glands, as specified in Paragraph 3.11 of this Section.

E. Couplings and transitional couplings for pipe less than or equal to 12 inches in diameter shall consist of a long body cast iron sleeve and shall have gaskets suitable for the pipe being joined. The bolts and nuts shall be corrosion resistant alloy steel such as Cor-Ten steel or an approved equal. Couplings shall be Romac style 510, Dresser style 153, Rockwell type 441, or approved equal. Transition couplings for pipe less than or equal to 12 inches in diameter shall be Dresser Style 162, Rockwell Type 441 or approved equal.

F. Couplings and transitional couplings for pipe greater than 12 inches in diameter shall consist of a steel sleeve and with gaskets suitable for the pipe being joined. The bolts and nuts shall be corrosion resistant alloy steel such as Cor-Ten steel or an approved equal. Couplings shall be Dresser style 38, or approved equal. Transition couplings for pipe greater than 12 inches in diameter shall be Dresser Style 62, or approved equal.

G. Couplings shall be provided with an epoxy coating.

H. Solid sleeves shall have long body type (12 inches min.) and mechanical joints with retainer glands.

I. Anchoring tees shall have main run ends as indicated on the Drawings or as required for the installation. The branch shall have a plain end with an integral gland and rotating mechanical joint gland to provide a restrained connection with the adjacent valve, fitting, etc.

2.5 GASKETS, GLANDS, NUTS, AND BOLTS

A. Gaskets, glands, nuts, bolts and accessories shall conform to ANSI/AWWA C111/A21.11 or C153/A21.53, as appropriate.

B. Gaskets shall be of plain tipped rubber, suitable for exposure to the liquid within the pipe.

C. Lubricants must be suitable for the type of fluid to be carried by the pipeline, and shall be NSF approved for water service, where applicable.

D. Glands shall be ductile or cast iron.

E. Bolts shall be high strength alloy.

2.6 TEST CONNECTIONS

A. Air release, test connections, and blow off locations shall be installed in the piping for pressure testing and disinfection at locations to be determined by the Contractor and the Engineer (there will be no separate payment for this work).

1. Corporation cocks shall be in accordance with ANSI/AWWA C800 and shall be ¾ inch diameter with CC thread on inlet by packed joint for copper on outlet as manufactured by Mueller, Ford, McDonald or approved equal.

2. Copper tubing shall be annealed Type K soft tubing and shall conform to the requirements of ASTM B88.

3. Upon completion of testing and disinfection, the corporation cock shall be removed and replaced with a brass plug and the copper tubing removed. The brass plug shall be field swabbed for disinfection in accordance with AWWA C651.

PART 3 EXECUTION

3.1 GENERAL

A. Deliver, handle, store and install ductile iron pipe in accordance with ANSI/AWWA C600.

3.2 DELIVERY, STORAGE AND HANDLING

A. Delivery of Pipe and Fittings

1. Coordinate delivery of pipe and fittings with installation or unload with proper equipment along the line of work outside the trench near as practicable to the point of final placement, facing in the proper direction and properly wedged secure. Give minimum 24 hour notice to the Engineer prior to pipe deliveries. Notice shall include the method of unloading.

2. Unload and handle pipe and fittings with a crane or backhoe of proper capacity outfitted with a steel cable sling, belt sling or other specially designed attachment to protect the pipe coating.

B. Storage of Materials

1. Store pipe in a manner to keep pipe interior free from dirt and foreign matter. Store pipe on stones, wood blocking, or other hard materials. Pipe may be stored on top of each other to the maximum stacking height specified by AWWA C600.

2. Contractor may store pipe at his yard if approved by the Engineer. The Engineer shall be permitted reasonable access for inspection.

3. Materials subject to corrosion shall be protected in accordance with manufacturer's recommendations.

C. Handling Materials

1. Handle pipe in such a manner so as to prevent damage to the concrete or mortar coating or lining using methods approved by the pipe manufacturer.

2. Pipe damaged during handling will be rejected and shall be replaced at the Contractor's expense.

3. Take every precaution to ensure that no foreign materials enter the pipe during handling.

3.3 COORDINATION

A. Existing mains may have to be shut down to complete the connections as shown on the Drawings and as specified herein.

1. Valves will only be operated by the Owner.

2. Submit requests for shutdown of existing piping to the Engineer at least 5 working days prior to the operations, and reschedule operations to prevent conflicts with the Owner's operations.

3. The Owner reserves the right to cancel the shut-down at any time without penalty if system conditions exist in which it would be a matter of public health or safety to do so.

4. The Owner does not guarantee complete shut down of valves. The Contractor shall make necessary provisions to do work under existing conditions.

3.4 DEFECTIVE PIPE

A. The Engineer reserves the right to reject defective pipe shipped to the job site or stored on the site. The Engineer will examine the pipe and determine if the pipe is damaged prior to installation of the pipe in the trench. Defective pipe or fittings will be rejected for use on this project. Defective pipe is classified as follows:

1. Damage to interior cement-mortar lining

2. Insufficient cement-mortar lining thickness

3. Pipe out of round

4. Damaged pipe barrel area

5. Damaged pipe bells or spigots

6. Missing, misplaced or illegible marking and identification

7. Outside pipe diameter shall not exceed allowable tolerance

B. If defective pipe is discovered after it has been installed, it shall be removed and replaced by the Contractor with sound pipe in a manner acceptable to the Engineer, at no additional cost to the Owner.

3.5 JOB CONDITIONS

A. Environmental Requirements

1. Do not lay pipe when weather conditions are unsuitable, as determined by the Engineer, for pipe laying work.

2. Equipment for pipe laying shall be maintained in good operating order.

3. Job site shall be kept clean of debris and organized to carry out operations in a safe and satisfactory manner.

B. Protection

1. At all times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. This provision shall apply during the noon hour and overnight, as well as during delays in the pipe laying operations.

C. Work Affecting Existing Pipelines

1. Location of Existing Pipelines:

a. Location of existing pipeline shown on the Drawings shall be considered approximate.

b. Contractor is responsible for determining the exact location of existing piping to which he shall make connections, or which he may disturb during earth moving operations, or which may be affected by his work in any way.

2. Work on Existing Pipelines:

a. Cut pipes as shown or required with machines specifically designed for this work.

b. Install temporary plugs to keep out all mud, dirt, water and debris.

c. Provide necessary adapters, fittings, pipe and appurtenances required.

d. Cut or tap existing mains at the mid span of a pipe barrel. In no case shall a pipe be cut or tapped within 24 inches of a pipe joint.

3.6 CLEANING PIPE AND FITTINGS

A. Clean and remove foreign matter from each pipe and fitting before placing in the trench. Remove pipe and fittings whose interior has been contaminated with oil, gasoline or kerosene and replace at no cost to the Owner. Remove pipe and fittings whose interior has been contaminated with any material which is a regulated drinking water contaminate or which damages the cement and replace at no cost to the Owner. Should foreign material or contaminants be observed in previously installed pipe, cease work until foreign material or contaminated pipe is decontaminated or removed.

B. Remove lumps, blisters, and excess coal-tar coating from the bell and spigot ends of each pipe or fitting. The outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and be dry and free from oil and grease before the pipe or fitting is laid.

C. On ductile iron pipe or fittings, the bell of the pipe and the spigot of the adjacent pipe or fitting shall be wire-brushed and cleaned of rust and dirt. The bell of the pipe or fitting and the spigot of the adjacent pipe shall be lubricated with the joint lubricant furnished with the pipe, and used in accordance with the manufacturer's directions.

3.7 ALIGNMENT AND GRADE

A. Lay and maintain the pipe at the required lines and grades as shown on the Drawings. Fittings shall be at the required locations with joints centered, and spigots properly fitted. No deviation shall be made from the required line and grade, except with the approval of the Engineer.

B. Joint Openings and Deflection:

1. The maximum allowable joint openings and deflection for push-on joint pipe and restrained joint pipe shall be one-half the manufacturer's maximum allowable opening and deflection.

C. Line or Grade Conflicts with Other Structures

1. Wherever obstructions not shown on the Drawings are encountered during the progress of the Work and interfere to such an extent that an alteration in the Drawing is required, the Engineer will order a deviation from the line and grade at locations where obstructions such as culverts, ducts, wire and/or pipes are encountered. The pipe shall be laid over or under such obstacles with a clearance of 6 inches. In general, the choice of "over" or "under" will be shown on the Drawings, but the Engineer reserves the right to make any alterations at the time of construction.

D. Where underground conditions indicate a change of alignment or grade, such change shall be made only with the written consent of the Engineer.

E. Except at locations indicated on the Drawings by the profile, particular care shall be exercised so that no high points are established where air can accumulate.

3.8 PIPE INSTALLATION

A. General Requirements

1. The pipe trench shall be prepared in accordance with Section 02315.

2. Keep trenches dewatered while installing pipe until all required pipe joints have been made and the trench has been backfilled above the water table to a point where pipe uplift will not occur when the pipe is empty.

3. Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Pipe and fittings shall be carefully lowered into the trench piece by piece by means of a crane, ropes or other tools or equipment, in such a manner as to prevent damage to pipeline materials and protective coatings and linings. Under no circumstances shall pipeline materials be dropped or dumped into the trench.

4. Carefully inspect pipe and fittings for cleanliness and defects prior to placing them in the trench.

5. Install underground warning tape over the pipe in accordance with Section 02317.

B. Laying Pipe

a. Install pipe with a minimum of 5 feet of cover, unless specifically indicated otherwise on the Drawings or directed by the Engineer.

b. Take every precaution to prevent foreign material from entering the pipe while it is being placed in the line. If the pipelaying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that, before lowering the pipe into the trench, a heavy, tightly woven canvas bag be placed over each end and left there until the connection is made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

2. When laying pipe, the spigot end shall be centered in the bell, the pipe forced home and the joint completely assembled. The pipe shall be adjusted to correct

line and grade and secured in place with approved backfill material, properly tamped under and around the pipeline.

3. When laying the pipe, fittings that do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe or fittings of proper dimensions to ensure a uniform space and a satisfactory joint.

C. Cutting Pipe

1. Pipe furnished on the job shall be furnished in full lengths. Cut ductile iron pipe without damage to the pipe or cement lining. The cutting shall be done to leave a smooth end at right angles to the axis of the pipe.

2. Cut ductile iron pipe either by the use of compression-type chain cutters which exert an even continuous force on the wall of the pipe or by power driven abrasive wheels.

3. On ductile iron pipe using rubber joints, the outside edge of the cut end must be tapered back approximately ¼ inch at an angle of about 30 degrees so as to provide for the proper assembly of this joint. This beveling of the outside edge of the end of the pipe can be done with a coarse file or portable grinder.

D. Permissible Deflection at Joints

1. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long-radius curves are permitted, the amount of deflection allowed shall not exceed one-half of the manufacturer's maximum allowable joint deflection, and shall be approved by the Engineer.

2. In general, radius curves called for on the Drawings or permitted at the time of construction are to be made using full lengths of pipe. The use of short lengths of pipe and extra joint in order to make a smaller radius turn will not be allowed without the written approval of the Engineer.

3.9 PUSH-ON JOINTS

A. Push-on joints shall be made in accordance with the manufacturer's instructions. Insert rubber gasket in the groove of the bell end of the pipe. Install gaskets in the pipe after lowering the pipe into the trench for installation. The bell and spigot shall be thoroughly cleaned of dirt and tar blisters in the trench utilizing a wire brush or bristle brush. Apply lubricant per the manufacturer's recommendations utilizing a paint brush. Place a clean rag under the joint to protect the joint from dirt caused by unintentional grounding of the pipe during jointing. Upon completion, remove the rag. Align the plain end of the pipe to be laid and insert in the bell of the pipe to which it is to be joined, and push home with a jack or by other means. After joining the pipe, use a metal feeler to make certain that the rubber gasket is correctly located.

B. On water pipe and fittings, make provisions for the electrical continuity of the pipeline. Insert two bronze wedges per joint to provide electrical continuity. Place wedges as close to the 3-o'clock and 9 o'clock positions as possible.

3.10 MECHANICAL JOINTS

A. Mechanical joints shall be made in accordance with Appendix A of ANSI A21.11/AWWA C111 and the manufacturer's instructions. Thoroughly clean and lubricate the joint surfaces and rubber gasket before assembly. Tighten bolts to the specified torques. Under no conditions shall extension wrenches or an extended handle ratchet wrench be used to secure greater leverage.

3.11 CONCRETE THRUST BLOCKS

A. Place poured-in-place concrete thrust blocks at all bends (regardless of the angle of deflection or direction), caps, offsets, hydrants, and tees, as well as in locations shown on the Drawings or directed by the Engineer. Poured-in-place thrust blocks shall be formed with wood forms; rough earth forms are not acceptable. Protect pipeline materials and fittings from direct adherence of the concrete thrust block by wrapping in plastic, roofing felt, reinforced manila paper or similar material. The thrust block shall not bear directly on the joint and shall not interfere with future adjustments, tightening, or removal of the joint. Thrust blocks shall bear against undisturbed soil at the side or end of the trench and this undisturbed surface shall be carefully cleaned off so as to be vertical. The thrust blocks shall have a minimum horizontal thickness of 2 feet and shall have the minimum bearing area listed on the Drawings, measured perpendicular to the direction of thrust.

B. Concrete thrust blocks shall be used in conjunction with retainer glands at all tees, bends, offsets, hydrants, caps, and plugs.

3.12 DISINFECTION

A. Pipe, fittings and valves installed under this contract shall be disinfected in accordance with Section 02501, before being placed into service.

3.13 TESTING

A. Pipe, fittings and valves installed under this contract shall be tested in accordance with Section 02502, before being placed into service.

END OF SECTION