STANDARD SPECIFICATIONS
FOR CONSTRUCTION OF WATER AND SEWER MAINS

January 2016

For the
Water and Sewer Departments

City of Baldwin
Habersham County, Georgia

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STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER AND SEWER MAINS WATER AND SEWER DEPARTMENTS

FOR THE

CITY OF BALDWIN, GEORGIA

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SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. WORK covered in this Section includes the surveying and field engineering required to complete the project and meet the provisions of this document.

1.02 QUALITY CONTROL

A. DEVELOPER/CONTRACTOR will employ a Land Surveyor registered in the State of Georgia and acceptable to the City of Baldwin.

1.03 SUBMITTALS

A. Submit name, address, telephone number and registration number of surveyor prior to beginning work if requested by the City.

B. Submit 3 sets of prints of record drawings with a surveyor's certificate verifying that elevations and locations are in conformance with the development drawings.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 SURVEY REQUIREMENTS

A. Construction Staking

The DEVELOPER/CONTRACTOR shall provide all construction staking using recognized surveying and engineering practices. The surveyor will locate lines, grades and locations called for in the approved development drawings.

B. Record Drawings ("As-Built Drawings")

Prior to final acceptance of a development, or before issuance of a Certificate of Occupancy, DEVELOPER/CONTRACTOR is required to provide the City of Baldwin three (3) sets of record drawings, and a digital set of drawings in Auto Cad compatible format, showing horizontal location of all structures and major appurtenances installed. These included, but are not limited to, manholes, sewer laterals, water mains, water valves, water meters, force mains, pump stations, air/vacuum release valves, structures, earth embankments, ponds, and any other component of the sewer or water system. All horizontal locations shall be referenced to any established coordinate systems or to existing streets or major structures. The elevations of all gravity sewers, storm sewers, structure inverts, and structure tops shall be shown.

END OF SECTION

SECTION 01070

ABBREVIATIONS/DEFINITIONS

PART 1 GENERAL

1.01 GENERAL

A. Wherever in these Specifications the abbreviations or pronouns in place of them are used, the intent and meaning shall be interpreted as specified herein. Wherever used in these Specifications, the following terms shall have the meanings indicated and shall be applicable to both the singular and plural thereof:

1.02 ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APHA	American Public Health Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
EPA	Environmental Protection Agency
EPD	Environmental Protection Division (State)
FS	Federal Specifications
MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
MUTCD	Manual on Uniform Traffic Control Devices
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NCSA	National Crushed Stone Association
NEMA	National Electrical Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCI	Prestressed Concrete Institute
SSPC	Steel Structures Painting Council
WEF	Water Environment Federation

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01570

TRAFFIC CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. DEVELOPER/CONTRACTOR shall furnish all materials and labor for the installation and continuous maintenance of traffic control devices throughout the project.

B. This item of work shall include furnishing, installing, maintaining, relocating and removing all traffic control devices used for the purpose of regulating, warning or directing traffic during the construction or maintenance of this project.

C. Upon completion of work, warning devices are to be removed by the DEVELOPER/ CONTRACTOR.

1.02 SAFETY

A. The governing factor in the execution and staging of work for this project is to provide the public with the safest possible travel conditions along the roadway through the construction zone. The DEVELOPER/CONTRACTOR shall arrange his operation to keep the closing of any lane of a roadway to an absolute minimum.

B. No work shall be started on any phase of the project until all appropriate traffic control devices are in place and in operation.

C. DEVELOPER/CONTRACTOR is to take all practical precautions to maintain traffic flow, and provide safety of workers and the general public.

D. At the end of each workday, contractor is to clear the roadway of all dirt and debris and add additional safety devices to maintain safe travel lanes for night traffic.

E. When not in use, all traffic control devices shall be removed, placed or covered so as not to be visible to traffic.

1.03 REFERENCES

A. Manual for Uniform Traffic Control Devices (MUTCD) (latest edition).

B. Georgia Department of Transportation (Ga. DOT) Standard Specifications for Construction of Roads and Bridges (latest edition), Section 150.

C. Georgia Department of Transportation (Ga. DOT) Standard Construction Details (latest edition).

PART 2 PRODUCTS

2.01 TRAFFIC CONTROL DEVICES

A. Traffic Control Devices include: signs and their supports, signals, pavement markings, barricades with sand bags, channelizing devices, warning lights, arrowboards, flaggers, or any other device used for the purpose of regulating, warning or guiding traffic through the construction zone.

B. All Traffic Control Devices used on this project shall conform to the plans, Ga. DOT Construction Details and Specifications, and MUTCD.

C. Traffic Control Devices shall be in proper, acceptable condition when in use. Devices which are unclear, damaged, or not correctly positioned shall be promptly restored to fully operational condition.

PART 3 EXECUTION

3.01 PLANS AND PERMITS

A. DEVELOPER/CONTRACTOR is to prepare and provide a traffic control plan and obtain all applicable and necessary permits from all appropriate authorities.

3.02 TRAFFIC CONTROL DEVICES

A. The DEVELOPER/CONTRACTOR shall be responsible for the proper location, installation, and arrangement of all traffic control devices. Special attention shall be given to advance warning signs during construction operations in order to keep lane assignment consistent with barricade placement at all times. The DEVELOPER/CONTRACTOR shall cover all Traffic Control Devices which are inconsistent with detour or lane assignment patterns during the transition from one construction stage to another.

B. Construction signs referring to daytime lane closures during working hours shall be removed or covered during non-working hours.

C. The DEVELOPER/CONTRACTOR shall ensure all Traffic Control Devices installed by him are operational 24 hours a day, including weekends and holidays. The DEVELOPER/CONTRACTOR shall provide inspections of all Traffic Control Devices (installed by him) at regular intervals throughout each day.

3.03 PUBLIC ACCESS

A. Private driveways and parking areas shall be accessible at all times unless temporary closings are necessary for construction work and the DEVELOPER/ CONTRACTOR has notified the affected individuals and has approval from them.

3.04 SAFETY

A. If trenches are to remain open overnight, or for an extended period of time, DEVELOPER/CONTRACTOR is to provide heavy duty cover plates to allow vehicles access.

B. Where flaggers are required, they are to be adequately trained and certified for the job.

C. When traveling in lanes open to public traffic, the DEVELOPER/CONTRACTOR's vehicles shall always move with and not against or across the flow of traffic. These vehicles shall enter and leave work areas in a manner which will not be hazardous to, or interfere with, traffic, and shall not park on or stop except within designated work areas. Personal vehicles shall not park within the right of way except in specific areas designated by the CITY.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. WORK to be performed under this section shall consist of clearing and grubbing the site within the limits of the approved Development Drawings and disposal of all waste materials.

B. WORK also included under this section shall include the removal and replacement of existing fences and the erection of temporary fences.

C. Definitions

1. Clearing: The removal and disposal of all exposed objectionable matter such as: trees, brush, logs, buildings, fences, poles, rubbish, loose boulders and other debris resting on or protruding through the ground surface.
2. Grubbing: The removal and disposal of all objectionable matter such as: logs, poles, stumps, structures, boulders, rubbish, and other debris which is embedded in the soil.

1.02 REGULATORY REQUIREMENTS

A. Conform to applicable code for disposal of debris.

B. Conform to local Fire Department Codes for burning debris on site. DEVELOPER/ CONTRACTOR shall obtain all necessary permits prior to burning on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials used for protection of trees and vegetation to remain during clearing operations shall be at DEVELOPER/CONTRACTOR'S option. Materials chosen are subject to review by the CITY OF BALDWIN upon installation shall be approved by the CITY to ensure maximum protection to vegetation.

B. Materials used for the repair of trees and vegetation damaged outside clearing limits shown on Drawings shall be at DEVELOPER/CONTRACTOR'S option but must be approved by the CITY prior to use.

C. Wound paint shall be a standard bituminous product.

D. Herbicides shall not be used unless written approval is given by the CITY.

E. Explosives shall not be used unless necessary permits are obtained form all Authorities having jurisdiction.

F. Materials used for the replacement or relocation of existing fences shall be of equal or superior quality to those fence materials existing prior to construction unless specified otherwise on the plans.

PART 3 EXECUTION

3.01 GENERAL

Where new construction on existing roads is required, the DEVELOPER/CONTRACTOR shall video tape and photograph the route prior to beginning construction in such a manner as to provide sound, visual evidence as to the pre-existing conditions along the route of construction. The CONTRACTOR shall keep these records on file; the CITY may request copies as needed.

3.02 CLEARING

A. No tree, shrub, or other landscaping plants shall be removed unless absolutely necessary for the construction of the proposed improvements. All shrubs or landscaping plants removed or damaged during construction shall be replaced by the DEVELOPER/CONTRACTOR at his expense, with landscaping approved by the CITY.

B. Limits of clearing shall be contained within the areas within Right-of-way, Easement and Construction limits as shown on the approved Development Drawings.

C. Existing fences that can be reused (if approved by the CITY) shall be carefully removed and stored at such a distance they shall not be damaged by construction activity.

D. Fences that cannot be reused shall be removed to such a distance to allow construction activity and shall be replaced with new materials similar to existing fences upon completion of construction.

3.03 GRUBBING

A. The limits of grubbing shall be contained within Right-of-way, Easement and Construction limits as shown on the approved Development Drawings.

B. Stumps and roots shall be grubbed and removed to a depth not less than 2 feet below existing grade or bottom of foundation structure.

C. All holes or cavities, which extend below the subgrade elevation of proposed WORK shall be filled with crushed rock or other suitable material and compacted to the same density as the surrounding material.

3.04 PROTECTION

A. Streets, roads, adjacent property, and other works to remain shall be protected throughout the work in accordance with local laws and ordinances.

B. DEVELOPER/CONTRACTOR shall make every effort to protect existing benchmarks, R/W markers, monuments, iron pins, property corner markers, etc. If any are disturbed or destroyed, CONTRACTOR shall provide services of a registered land surveyor to replace the markers.

C. No trees shall be cut outside of areas designated without specific approval of the CITY, and any trees designated shall be protected from damage by DEVELOPER/CONTRACTOR'S construction operations.

D. Existing trees and other vegetation to remain shall be protected as directed by the CITY:

1. Trees shall be protected by fencing, barricades, or wrapping.
2. Shrubs and bushes shall be protected by fencing, barricades, or wrapping. Wrapping of bushes and shrubs with plastic film will not be permitted.
3. Shallow-rooted plants shall be protected at ground surface under and in some cases outside the spread of branches by fencing, barricades, or ground cover protection.

E. In the event archaeological resources are uncovered, the DEVELOPER/ CONTRACTOR shall notify the CITY OF BALDWIN prior to proceeding with WORK.

F. DEVELOPER/CONTRACTOR is to erect temporary fences as necessary to preserve the privacy of all affected property owners whose existing fences are being removed or relocated. Temporary fences shall be of sufficient strength and quality to prevent escape of animals and livestock and to prevent the intrusion of animals and people.

G. It is DEVELOPER/CONTRACTOR'S responsibility to coordinate, with each affected property owner, the removal and erection of fences and to maintain any temporary and/or relocated fences throughout the contract period.

H. DEVELOPER/CONTRACTOR shall assume all costs incurred by any property owner in the loss of animals or livestock due to an insufficiency of replaced or temporary fences during the contract period and maintenance period thereafter.

I. It is the DEVELOPER/CONTRACTOR'S responsibility to secure any insurance necessary to protect himself in the event of loss or damage to any animals, livestock and property for the duration of the project and maintenance period.

3.05 DISPOSAL

A. DEVELOPER/CONTRACTOR shall remove and dispose of all excess material resulting from clearing or site preparation operations. DEVELOPER/ CONTRACTOR shall dispose of such materials in a manner acceptable to the CITY OF BALDWIN at an approved location where such materials can be lawfully disposed.

B. DEVELOPER/CONTRACTOR may, at no cost, retain any materials of value from clearing operations for his own use or disposal by sale unless otherwise stated in these Specifications. Such material shall be removed from construction area before completion of WORK. The CITY OF BALDWIN assumes no responsibility for protection or safekeeping of any materials so retained by DEVELOPER/ CONTRACTOR.

C. Materials will not be disposed of by burying.

D. Burning will be permitted if the required permits have been acquired from the local Fire Department. Burning of debris on site must conform to local fire department codes and must be in compliance with the 1997 EPD Air Quality Rules and Regulations and the 1992 EPD Air Quality Act. Burning will be permitted only at times when conditions are considered favorable for burning and at locations approved by proper State or local authorities. Materials to be burned shall be piled neatly and, when in a suitable condition, shall be burned completely. Piling for burning shall be done in such a manner and in such locations as to cause the least fire risk. All burning shall be so thorough that the materials are reduced to ashes. No logs, branches, or charred pieces shall be permitted to remain. DEVELOPER/CONTRACTOR shall at all times take special precautions to prevent fire from spreading to areas beyond the limits of cleared areas and shall have available at all times, suitable equipment and supplies for use in preventing and suppressing fires. Unguarded fires will not be permitted.

E. Material to be removed from site shall be removed as it accumulates to prevent any unsightly spoil areas.

F. All unsuitable excavated materials must be properly disposed of in a manner acceptable to the CITY and will not adversely affect the environment. Disposal of construction debris and solid waste must be in compliance with the 1997 EPD Land Protection Solid Waste Act and Rules and Regulations.

END OF SECTION

SECTION 02225

EARTHWORK FOR UTILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

Work under this section shall include all operations necessary for excavating, backfilling and compaction of material necessary for the construction of pipelines and all appurtenant facilities including sewage pump station, concrete saddles, pipe protection, etc., and for the disposal of waste and unsuitable materials.

1.02 RELATED WORK

A. Section 02270 – Temporary Erosion Control

B. Section 02931 - Grassing

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), Annual Book of Standards

1. ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400) ft-lbf/ft^3).

2. ASTM D2167, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

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

4. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

5. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

6. AWWA C605, Standard for Underground Installation of PVC Pressure Pipe and Fittings for Water

7. AWWA C150, American National Standard for the Thickness Design of Ductile-Iron Pipe

8. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes

B. Occupational Safety and Health Administration (OSHA), Code of Federal Regulations 29 CFR Part 1926, Subpart P – Excavation, latest revision.

1.04 GEOTECHNICAL ENGINEERING SERVICES

A. The CONTRACTOR-DEVELOPER shall obtain the service of a Georgia registered geo-technical engineer to perform all compaction tests specified herein. Evidence and documentation of testing shall be required at the CITY's discretion.

PART 2 PRODUCTS

2.01 BEDDING STONE

A. Class IA or IB aggregate materials in accordance with ASTM D 2321 for gravity sewer, wet trench conditions, under roads, structures and driveways.

B. For PVC water line and forcemain, CONTRACTOR shall use reused or imported Class II, III or IVA materials in accordance with ASTM D2321. Materials shall be free of stone, clods, broken rock, or concrete larger than 1.5 inches in largest dimension, organic matter, rubbish, or other unsuitable material for all other trench conditions not mentioned in Paragraph 2.01.A, unless otherwise directed by ENGINEER or OWNER.

2.02 BACKFILL

Soil types shall be in accordance with ASTM D2487, and the Unified Soil Classification System. Backfill Classification shall be in accordance with ASTM D2321. **Suitable Subsoil**: Reused and/or imported free of stone larger than 3 inch size, and debris. For backfill supporting structures and piping, Unified Soil Classification System (USCS) Groups GW and GP compacted to 97% Modified Proctor per ASTM D-1557. For backfill under roadways, pavement and sidewalks, USCS Groups GW and GP compacted to 98% Standard Proctor, Groups GM, GC, SW, SP, and SM compacted to 98% Standard Proctor, USCS Group SC compacted to 99% Standard Proctor, and USCS Groups ML and CL compacted to 100% Standard Proctor per ASTM D-698. For backfill not supporting any type of structure, paving, or sidewalk, Groups GW, GP, GM, and GC compacted to 90% Standard Proctor, Groups SW, SP, and SM compacted to 91% Standard Proctor, Groups ML, and CL compacted to 92% Standard Proctor, and Groups OL, MH, CH, and OH compacted to 93% Standard Proctor per ASTM D-698. **Unsuitable soil**: USCS Groups MH, CH, OL, OH, and PT.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify bedding and backfill material to be used are acceptable. Do not use frozen material.

B. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. When necessary, compact subgrade surfaces to density requirements for backfill material.

3.03 SHEETING, SHORING AND BRACING

A. CONTRACTOR shall be responsible for supporting and maintaining all excavations required even to the extent of sheeting and shoring the sides and ends of excavations with timber or other supports. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to conform with OSHA 29 CFR 1926, Subpart P – Excavations, latest revision.

B. Excavations adjacent to existing or proposed utilities, buildings and structures, or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent utilities and structures shall be done when necessary to maintain utilities and structures in safe condition. The CONTRACTOR-DEVELOPER shall be held liable for any damage resulting to such utilities, structures or pavements as a result of his operations.

C. The need and adequacy of sheeting, shoring, bracing, or other provisions to protect men and equipment in a trench or other excavation shall be the sole and exclusive responsibility of CONTRACTOR-DEVELOPER.

3.04 EXCAVATION

A. Trench Excavation

1. Trench excavation shall consist of the removal of materials necessary for the construction of pipelines and all appurtenant facilities including collars, concrete saddles, and pipe protection called for on Drawings.

2. Excavation for pipelines shall be made in open cut unless otherwise shown on Drawings. Trenches shall be cut true to lines and grades shown on Drawings. Minimum pipe cover shall be 48” measured from the top of pipe to the ground surface.

3. Use of motor-powered trenching machine will be permitted but full responsibility for the preservation, replacement, and/or repair of damage to any existing utility services and private property shall rest with CONTRACTOR.

4. Bell holes for bell and spigot pipe and/or mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench or bedding material.

5. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

6. Unless otherwise specified herein or shown on Drawings, wherever pipe trenches are excavated below elevation shown on Drawings, CONTRACTOR-DEVELOPER, at his own expense, shall fill the void thus made to proper grade with Class D concrete or with compacted layers of crushed rock or other material conforming to requirements specified herein for backfill.

7. In all cases where materials are deposited along open trenches they shall be placed so that no damage will result to the WORK and/or adjacent property in case of rain or other surface wash.

8. Remove soft, spongy, or otherwise unstable materials encountered at elevation of pipe which will not provide a firm foundation for the pipe. Extend bedding depth as necessary to reach firm materials.

B. Any unauthorized excavation shall be corrected at the CONTRACTOR-DEVELOPER's expense.

C. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

D. Grade top perimeter of excavation to prevent surface water run-off into excavation.

E. Notify CITY and Developer-ENGINEER of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.

3.05 DEWATERING

A. CONTRACTOR shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the WORK. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of final lines and grades of bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times. Dewatering methods used shall be acceptable to ENGINEER. Footing pits or trenches shall be protected by small earth dikes and plastic covers when they are left open in rainy weather.

B. Unless specifically authorized by CITY, groundwater encountered within the limits of excavation shall be depressed to an elevation not less than twelve (12) inches below the bottom of such excavation before pipe laying or concreting is started and shall be so maintained. No concrete structures shall be exposed to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Water shall not be allowed to rise above

bedding during pipe laying operations. CONTRACTOR shall exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Dewatering operations shall commence when ground or surface water is first encountered and shall be continued until such times as water can safely be allowed to rise in accordance with provisions of this section.

C. Standby pumping equipment shall be kept on the job site. A minimum of one standby unit (one for each ten in the event well points are used) shall be available for immediate installation should any pumping unit fail. Installation of well points or deep wells shall be adequately sized to accomplish the WORK.

D. CONTRACTOR-DEVELOPER shall not operate dewatering devices (i.e., pumps, etc.) before the hour of 8:00 AM and after the hours of 8:00 PM in a residential area unless otherwise approved by CITY.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with foundation backfill. Foundation backfill shall be placed in bottom of trench to within 6" of the bottom of pipe. Six (6) inches of bedding stone shall be placed over the top of the foundation backfill.

F. CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. Conveyance of water shall be such as to not interfere with construction operations or surrounding property owners. No water shall be drained into WORK built or under construction. CONTRACTOR-DEVELOPER will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

G. Storm water runoff shall be controlled by means of temporary erosion control methods specified, as shown on Drawings, or as directed by ENGINEER.

H. Water shall be disposed of in such a manner as not to be a menace to public health and in accordance with applicable Environmental Protection Agency, Corps of Engineers, and State Environmental Protection Division standards and permits.

3.06 BEDDING/BACKFILLING

A. The backfilling of trenches shall be started immediately after construction. Bedding and backfill material shall be earth or aggregate in accordance with Part 2 and the Drawings. Material shall be deposited in the initial horizontal layer (before compaction) on each side of the pipe. The initial layer shall be thoroughly tamped or rammed around the pipe until the initial layer's density is equal to the density of the adjacent undisturbed soils, as per the CITY Standard Details. The second bedding material layer shall be deposited horizontally to a depth to provide a cover of not less than 12 inches over top of pipe. The remainder of the backfill shall be placed in horizontal layers 18 inches (maximum) in depth. The second and subsequent bedding/backfill layers shall be compacted by compaction tools to a density equal to the density of the adjacent undisturbed soils.

B. Compact aggregate and soil backfill under roads, structures, and driveways to a minimum of 95% of maximum dry density at not less than 2% below nor more than 2% above the optimum moisture content as determined by ASTM D 698.

C. All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be removed and repaired to the satisfaction of CITY and then re-backfilled.

D. Backfilling shall not be done in freezing weather, and shall not be done with frozen material or upon frozen materials.

E. All backfilling shall be left with smooth, even surfaces, properly graded and shall be maintained in this condition until final completion and acceptance of the work.

F. Leave stockpile areas completely free of excess fill materials. After construction and cleanup, stockpile areas shall be seeded in accordance with provisions specified in Section 02931.

G. Use "Class 5" bedding in all wet trenches and under roads/driveways, regardless of pipe material. Use "Class 5" bedding for all PVC gravity sewer. See Detail S-9

H. Use "Class 4" bedding for PVC waterline, and DIP gravity sewer and sewer forcemains. See Detail S-10.

I. Use "Class 2" bedding for DIP waterline. See Detail S-11.

J. "Class 2" Bedding is not allowed for sewer lines.

3.07 SUBSURFACE OBSTRUCTIONS

A. In excavating, backfilling, and laying pipe, case must be taken not to remove, disturb, or inure any existing water, telephone, gas pipes, storm drainage pipe, headwalls or catch basins, or other conduits or structures. If necessary, the CONTRACTOR-DEVELOPER at his own expense, shall sling, shore up, and maintain such structures in operation, and shall repair any damage to them. Before final acceptance of the work, he shall return all such structures to as good condition as before the work started.

B. The CONTRACTOR-DEVELOPER shall give sufficient notice to the interested utility of his intention to remove or disturb any pipe, conduit, etc., and shall abide by their regulations governing such work. In the event that any subsurface structure becomes broken or damaged in the execution of the work, the CONTRACTOR-DEVELOPER shall immediately notify the proper authorities, and shall be responsible for all damage to persons or property caused by such breaks. Failure of the CONTRACTOR-DEVELOPER to promptly notify the affected authorities shall make him liable for any needless loss so far as interference with the normal operation of the utility.

C. When pipes or conduits providing service to adjoining buildings are broken during progress of the work, the CONTRACTOR shall repair them at once.

D. Delays such as would result in buildings or residences being without services overnight or for a needlessly long period during the day will not be tolerated. Should it become necessary to move the position of a pipe, conduit or structure, it shall be done by the CONTRACTOR-DEVELOPER in strict accordance with the instructions given by the utility owner involved.

E. The CITY will not be liable for any claim made by the CONTRACTOR-DEVELOPER based on underground obstructions being different from that indicated in the plans.

3.08 BORROW EXCAVATION

Wherever the backfill of excavated areas or the placement of embankments or other fills require material not available at the site, suitable material shall be obtained from other sources. This may require the opening of borrow pits at points not immediately accessible to the WORK. Before a borrow pit is opened, the quality and suitability of the material to be obtained shall be approved by the CITY. Any soil tests required for approval of the borrowed material proposed shall be at the DEVELOPER'S expense.

3.09 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

A. Materials removed by excavation, which are suitable for the purpose, shall be used to extent possible for backfilling pipe trenches and for making embankment fills, subgrades or for such other purposes as may be shown on Drawings. Materials not used for such purposes shall be considered waste material and shall be disposed of at the CONTRACTOR-DEVELOPER's expense.

B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.

C. Unsuitable materials, consisting of rock, wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the CITY, shall be removed from the work site and disposed of by CONTRACTOR-DEVELOPER at his expense.

D. No waste material shall be dumped on private property unless written permission is furnished by owner of property and unless a dumping permit is issued from local jurisdiction.

3.10 TESTING

A. Compaction of fill and backfill to the specified moisture-density relationship of soils shall be verified by in-place density tests using ASTM D 2167, D1556 or other ASTM in-place density tests approved by the CITY. Maximum density determination and in-place density tests shall be performed by a soils technician employed by the CONTRACTOR-DEVELOPER. Frequency and location of tests shall be adequate to ensure proper compaction has been achieved.

B. Areas not meeting the required compaction shall be re-compacted until the desired degree of compaction is achieved. All costs associated with **re-testing** failed areas of compaction shall be paid for by the CONTRACTOR-DEVELOPER.

3.11 PROTECTION

Protect excavation by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in of loose soil into excavation. Protection shall be in accordance with OSHA 29 CFR 1926, Subpart P-Excavations, latest revision.

3.12 FINAL GRADING

A. After other earthwork operations have been completed, sites of all structures and embankments shall be graded to finished grade as shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond required limits. Finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from use of hand tools. If CONTRACTOR is able to obtain required degree of evenness by means of mechanical equipment, he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished.

B. Unless otherwise specified or shown on the Drawings, all finished ground surfaces shall be graded and dressed to present a surface varying not more than plus or minus 0.10 foot. Any finished surfaces resulting in inadequate drainage or washouts shall be corrected by the CONTRACTOR-DEVELOPER at his expense.

3.13 SETTLEMENT

A. CONTRACTOR-DEVELOPER shall be responsible for all settlement of backfill, fills, and embankments which may occur during warranty period.

B. CONTRACTOR-DEVELOPER shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from CITY.

END OF SECTION

SECTION 02227

ROCK REMOVAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Removal of all rock materials discovered during excavation for the purpose of construction. Removal shall include drilling and/or blasting incidental thereto and disposal of excavated materials.

B. When necessary for prosecution of the WORK, the use of explosives to assist rock removal may be exercised by DEVELOPER provided this use is in compliance with all local, State, Federal and other Governmental regulations applying to transportation, storage, use and control of explosives.

1.02 RELATED WORK

A. Section 02225 - Earthwork for Utilities

1.03 REFERENCES

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

B. OSHA 2207 - Construction Industry Standards, Subpart T - Demolition.

C. Rules and Regulations of Safety Fire Commissioner, Chapter 120-3-10.

1.04 QUALITY ASSURANCE

A. Explosives Firm: Company specializing in explosives for disintegration of subsurface rock with documented experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code, including Rules and Regulations of Safety Fire Commissioner, Chapter 120-3-10, for explosive disintegration of rock.

B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

C. All explosives shall be stored securely in compliance with all laws and ordinances, and all such storage places shall be clearly marked DANGEROUS EXPLOSIVES. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents. Locked storage shall be provided satisfactory to the CITY, never closer than allowed by the Safety Fire Commissioner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Rock (Definition): Solid mineral material with a volume in excess of 1/2 cu yd that cannot be broken down and removed by use of heavy construction equipment, such as a Caterpillar 225 or equivalent, having a bucket curling force rated at not less than 25,700 pounds, bulldozer such as a Caterpillar D8K equipped with single tooth hydraulic ripper, 3/4 cu yd capacity power shovel, rooters, etc., and without drilling or blasting. Materials which can be loosened with a pick, hard pan, boulders less than 1/2 cu yd in volume, chert, clay, soft shale, soft and disintegrated rock and any similar material shall not be considered as rock. (All materials to be considered unclassified or common excavation)

B. Explosives: Shall be suitable for intended purposes at the DEVELOPER's option subject to review by the CITY.

C. Delay Devices: Type recommended by explosives firm to be used as accessory to explosives. Subject to review by the CITY.

D. Blasting Mat: When the use of explosives is necessitated during prosecution of the WORK, DEVELOPER shall incorporate the use of blasting mats of type recommended by explosives firm to lessen the danger of projectiles occasionally resultant from blasting of rock.

PART 3 EXECUTION

3.01 INSPECTION

A. Rock in utility trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipeline (Inches)	Depth of Excavation Below Bottom of Pipe (Inches)
Less than 4	6
4 to 6	8
8 and over	12

Space below grade for pipe shall then be backfilled with 3/4-inch crushed rock or gravel or other approved materials and tamped to proper grade.

3.02 ROCK REMOVAL - MECHANICAL METHOD

A. Excavate for and remove rock by the mechanical method.

B. Where pipes are constructed on concrete cradles, rock shall be excavated to bottom of cradle as shown on plans.

C. Where rock foundation is obtained at grade for over 50 percent of area of any one structure, the portion of foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class C concrete.

D. Where rock foundation is obtained at grade for less than fifty (50%) of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of twelve (12) inches below grade and the space below grade shall be backfilled with crushed stone as specified for pipelines.

E. Rock excavation near existing pipelines or other structures shall be conducted with utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of the CITY and by DEVELOPER at his own expense.

F. Remove excavated material from site.

G. DEVELOPER shall correct excess rock removal by backfill to grade with Class C (3000 psi) concrete in accordance with backfilling and compaction requirements of Section 02225 (Earthwork for Utilities), at his own expense.

3.03 ROCK REMOVAL - EXPLOSIVES METHODS

A. The DEVELOPER shall notify any owners of adjacent buildings or structures, and any public utility owners having structures or other installations above or below ground, in writing prior to use of explosives. Such notice shall be given sufficiently in advance so that they may take such steps as they may deem necessary to protect their property from injury and/or damage.

B. Rock excavation by use of explosives shall be conducted with due regard for safety of persons and property in the vicinity and in strict conformance with requirements of local, State and Federal ordinance, laws and regulations of the Safety Fire Commissioner.

C. Blasting shall be conducted so as not to endanger persons or property, and whenever required, the blast shall be covered with mats or otherwise satisfactorily confined. The DEVELOPER shall be held responsible for and shall make good any damage caused by blasting or accidental explosions.

D. The DEVELOPER shall permit only authorized and qualified persons to handle and use explosives.

E. Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.

F. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

G. All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The

DEVELOPER shall be held responsible for maintaining an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.

H. No explosives or blasting agents shall be abandoned.

I. DEVELOPER's employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades, to ensure safety.

J. A seismograph shall be used at the nearest structure during blasting events that are within 750 feet of the nearest house, public building, school, church, commercial or institutional building and roadway. The velocity/shock wave shall not exceed the established limits of U.S. Bureau of Mines RI 8507; appendix (b).

Exception: Where all pedestrian and vehicular traffic on a roadway can be restricted to a distance of 750 feet or greater from the blast site at the time of the firing of the blast or where a variance is issued by the State Fire Marshal’s Office.

K. Disintegrate rock and remove from excavation.

L. Cut away rock at excavation bottom to form level bearing.

M. Remove shale layers to provide sound and unshattered base for pipe foundations.

N. Remove excavated material from site.

O. Correct unauthorized rock removal or overbreak in accordance with backfilling and compaction requirements at his own expense.

3.04 FIELD QUALITY CONTROL

Provide for visual inspection of bearing surfaces and cavities formed by removed rock for inspection by the CITY.

END OF SECTION

SECTION 02270

TEMPORARY EROSION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Erosion control shall be employed during all phases of the construction period and shall include all measures required to prevent soil erosion from the site until permanent erosion control measures are installed. WORK shall be accomplished through, but not limited to, the use of berms, dikes, sediment barriers, sediment traps, sediment basins, silt fences, temporary grasses, check dams, mulching, construction exits and slope drains.

B. Erosion control measures described herein shall be installed prior to initiation starting construction activities and continued until such time as permanent planting and restoration of natural areas is effectively in control of erosion from project site.

C. Failure to install and maintain temporary erosion control measures throughout the construction period may be cause to halt construction by the CITY or governing authorities until such measures are correctly installed and operational.

For obtaining a Land Disturbance Activity Permit, The DEVELOPER/CONTRACTOR shall submit the Erosion control Plan and Application to the appropriate jurisdiction.

1.02 RELATED WORK

Section 02272 - Rip Rap

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. DEVELOPER/CONTRACTOR shall comply with applicable codes, rules, ordinances, regulations, and laws of local, municipal, state or federal authorities having jurisdiction over project.

C. "Manual for Erosion and Sediment Control in Georgia" published by the State Soil and Water Conservation Committee of Georgia, latest edition.

D. DEVELOPER/CONTRACTOR shall comply with the State of Georgia Erosion and Sedimentation Control Act of 1975, latest amendment or revision. All erosion and sedimentation control measures shall be designed, installed, and maintained in accordance with the Manual for Erosion and Sedimentation Control in Georgia, latest edition.

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E. DEVELOPER/CONTRACTOR shall comply with Georgia Department of Natural Resources Environmental Protection Division National Pollutant Discharge Elimination System (NPDES) General Permits for Construction Activity GAR 100001, GAR 100002 & GAR 100003 activity permits

PART 2 PRODUCTS

All products shall comply with the Manual for Erosion and Sedimentation Control in Georgia, latest edition.

PART 3 EXECUTION

3.01 RUN-OFF EROSION AND SEDIMENTATION CONTROLS

A. During construction, route run-off through sedimentation barriers and check dams as practical.

B. DEVELOPER/CONTRACTOR shall maintain sedimentation devices in functional condition. Sedimentation barrier, silt fences, and check dams shall be cleaned out when these devices are **AT MOST** 60 percent of their capacity. Defective materials in barriers and check dams shall be replaced.

C. DEVELOPER/CONTRACTOR shall establish sedimentation barriers at the toe of slopes under construction. These barriers may be relocated and reused after permanent slope stabilization becomes established. As they are relocated, any defective materials shall be replaced. In addition, all debris and silt at previous location will be removed.

D. A 6-inch minimum thickness of crushed stone construction exit pad shall be located at all access points to site from public streets in accordance with details shown on Drawings. All construction vehicles leaving construction site shall have mud cleaned from their tires at these points to protect public streets from the transportation of sediment from site.

3.02 CLEANUP AND REMOVAL

A. At the time that permanent erosion control is effective, temporary devices and their accumulated sediments shall be removed.

B. Silts and deposits removed from control barriers shall be placed in eroded areas and shall be replanted.

END OF SECTION

SECTION 02272

RIP RAP

PART 1 GENERAL

1.01 SCOPE OF WORK

This section pertains to the use of riprap for the protection of rivers, creeks and ditches from the effects of erosion and scouring. The work required consists of all materials, accessories, equipment, tools and labor required to install riprap.

1.02 REFERENCES

A. Manual for Erosion and Sediment Control in Georgia (SCS Manual published by the State Soil and Water Conservation Committee of Georgia (latest edition).

B. Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges (latest edition).

PART 2 PRODUCTS

2.01 RIP RAP

All stone for rip rap shall conform to the following tables for the type specified on the drawings as recommended by the Georgia DOT Standard Specifications, Section 603:

TABLE NO. 1
GRADED RIP RAP STONE

Type Ga. D.O.T.	**Screen Size inches (Sq. opening)**			**Common Uses**	**Filter Stone ASTM D-448**
	Max.	**Avg.**	**Min.**		
3	12	9	5	Creek Banks Pipe Outlets	6 or 57
1	24	12	7	Lakes & Shorelines, Rivers	3, 4 or 5

2.02 FILTER BEDDING STONE

Materials used for filter bed stone shall conform to the following table as recommended by the Georgia DOT Standard Specifications, Section 603:

FILTER BEDDING STONE

ASTM D-448 TABLE 1	Normal Sizes (inches)
3	2" - 1"
4	1 1/2"-3/4"
5	1" - 1/2"
6	3/4"-3/8"
57	1" - No. 4

2.03 GEO-TECHNICAL FILTER FABRIC

A. As an alternate to filter bedding stone, the DEVELOPER/CONTRACTOR may use geo-technical filter fabric.

B. Filter fabric shall have strength and engineering properties that meet or exceed those of MIRAFI 700X or PROPEX 1199, or equivalent. Filter fabric shall be as recommended by the Georgia DOT Standard Specifications, Section 171.

2.04 LOCALLY EXCAVATED ROCK

Rock excavated from the site may be used for work described under this section, provided that the quality and size requirements meet the requirements of Articles 2.01 and 2.02.

2.05 MATERIAL AVAILABILITY

The gradations of stone sizes listed in these tables are guidelines. Individual quarries may produce different gradations depending on local conditions. If gradations are different from those listed, DEVELOPER/CONTRACTOR is to notify the CITY OF BALDWIN for approval prior to use on the project.

PART 3 EXECUTION

3.01 STONE OR CONCRETE RIP RAP

A. Prepare area to receive rip rap. Ensure area is sufficiently stable and compacted to receive the stone.

B. Install either filter stone to thickness specified on drawings, or geo-technical filter fabric per manufacturer's recommendations.

C. Upon completion of the filter bed preparation, the rip rap shall be dumped and handled into place to form a compact layer to a thickness as shown on the drawings. Tolerance for rip rap shall be plus 6 inches, with no under-tolerance permitted.

3.03 CLEAN-UP

A. After installation is complete, the area surrounding the riprap shall be cleared of all debris.

B. Grassing or mulch stabilization is to be installed on all disturbed areas after clean-up is complete.

END OF SECTION

SECTION 02300

BORING AND JACKING

PART 1 GENERAL

1.01 SCOPE OF WORK

WORK covered in this section includes furnishing all labor, materials, accessories, equipment and service required to properly complete pipeline construction using boring and jacking under railroads and State, County, or City highways and streets, as described herein and/or shown on Drawings.

Any tunneling required shall be designed, specified, and permitted by the DEVELOPER, and reviewed by the CITY.

1.02 RELATED WORK

A. Section 02225 - Earthwork for Utilities

B. Section 02660 - Water Distribution Systems

C. Section 02732 - Sanitary Sewer Force Mains

D. Section 02736 - Sanitary Sewer

E. Section 03300 - Concrete

PART 2 PRODUCTS

2.01 MATERIALS

A. Boring and Jacking

Minimum casing size shall be 12-inches in diameter. Steel casing pipe, sizes 12 inches through 24 inches shall be spiral or straight seam welded steel pipe conforming to ASTM A 139, Grade A. Minimum wall thickness of steel pipe for railroad and roadway crossings shall be in accordance with Owner's specifications, or 0.25" Wall minimum, whichever is greater.

B. Carrier Pipe: All carrier pipes shall be DIP installed with restrained joint gaskets as specified in Section 02660.

C. Class "D" (2500 psi) Concrete: As specified under Section 03300 (Concrete).

PART 3 EXECUTION

3.01 GENERAL

A. Any solidification of embankments, boring heading, or sides shall be the DEVELOPER/ CONTRACTOR'S responsibility and shall be done at his own expense.

B. Trench excavation; all classes and types of excavation; the removal of rock, muck, debris; the excavation of all working pits; and backfill requirements of Section 02225 are included under this section.

C. Adequate sheeting, shoring, and/or bracing for embankment operating pits and other appurtenances shall be placed and maintained to ensure that WORK proceeds safely and expeditiously. Upon completion of required WORK, the sheeting, shoring, and bracing shall be left in place, cut off, or removed, as designated by the CITY.

D. DEVELOPER/CONTRACTOR shall maintain and operate pumps, well points, and drainage system equipment to keep work dewatered at all times.

E. Bored installations shall be a bored-hole diameter essentially the same as the outside diameter of casing pipe to be installed.

F. Casing pipe shall be jacked into boring as soon as possible after boring is made. Lengths of casing pipe as long as practical shall be used. Joints between sections shall be completely welded as recommended for joining the particular type of pipe.

G. Once jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of DEVELOPER/CONTRACTOR.

H. Care shall be taken to ensure that casing pipe installed by boring and jacking or open cut method will be at the proper alignment and grade.

I. Open cut installations, where permitted, shall be in accordance with details and procedures shown on Drawings.

J. Ends of casing shall be sealed in accordance with Details.

K. After casing pipe is installed, the carrier pipe shall be installed exercising care to protect its coating and lining and maintain its joint integrity. Carrier pipe shall be concentric and be placed in proper horizontal and vertical alignment using prefabricated pipe collars spaced radially around pipe and secured to remain firmly in place. Spacing of collars shall be no greater than ten (10') feet on center longitudinally in casing pipe. See Details.

3.02 HIGHWAY/ROADWAY CROSSINGS

A. DEVELOPER/CONTRACTOR is responsible for the permitting, coordinating and scheduling of all construction work within State, County, or CITY highways, or railroad rights-of-way prior to, during, and after utility installation.

B. DEVELOPER/CONTRACTOR shall review and coordinate construction methods, materials, and safety measures with the affected OWNER.

C. For open trench cut installations, DEVELOPER/CONTRACTOR shall be responsible for scheduling and coordinating all construction work. WORK at one particular crossing shall be completed with the trench backfilled, compacted, and a temporary crushed stone surface provided for traffic before any work is started on another such crossing.

D. Installations shall be done to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.

E. Where sodding is disturbed by excavation or backfilling operation, such areas shall be replaced by mulch sodding on slopes 5 percent or less. Slopes over 5 percent shall be replaced with block sodding. No separate payment shall be made for sodding which shall be included in the bid prices for installation of pipe.

F. Trench excavation within the right-of-way, but not under pavement, shall be backfilled as described in Section 02225 (Earthwork for Utilities).

G. Surplus material shall be removed from the right-of-way and the excavation finished flush with surrounding ground.

H. Grout backfill shall be used for unused bores or abandoned pipes.

I. Boring, jacking, or driving of casing pipes shall be accomplished without jetting, sluicing, or wet boring.

J. Excavated materials and equipment shall not be placed on the pavement or shoulders of roadways.

K. In no instance will DEVELOPER/CONTRACTOR be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadways.

END OF SECTION

SECTION 02601

MANHOLES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. WORK required under this section consists of all materials, accessories, equipment, tools, and labor required to install precast concrete standard manholes.

B. Construction of cast-in-place or precast manholes shall conform to ASTM C-478.

1.02 RELATED WORK

A. Section 02225 - Earthwork for Utilities

1.03 REFERENCES

A. ASTM A 48, Standard Specification for Gray Iron Castings.

B. ASTM C 32, Standard Specification for Sewer and Manhole Brick (made from clay or shale).

C. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.

D. ASTM C 443, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

E. ASTM C 478, Standard Specification for Precast Reinforced Concrete Manhole Sections.

F. ASTM C 1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) test.

G. ASTM C 923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

H. ASTM C 990, Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

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1.04 QUALITY ASSURANCE

A. After delivery to site, materials which have been damaged in transit or are otherwise unsuitable for use in the WORK, shall be rejected and removed from the site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete

1. Concrete, cement, sand and water used in manhole construction shall conform to the applicable requirements stated in ASTM C-478.

2. Steel reinforcement shall conform to the applicable requirements of ASTM C-478.

B. Precast Concrete Manholes

1. Precast concrete manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming with the typical manhole details as shown on Drawings, concrete to be Type II, 4,000 psi concrete.

2. All Precast manhole sections shall be wetcast and shall be manufactured, tested, and marked in accordance with latest provisions of ASTM C-478.

3. Ends of each reinforced concrete manhole riser section and bottom end of manhole top section shall be so formed that when manhole risers and top are assembled, they will make a continuous and uniform manhole.

4 Joints of manhole sections shall be of tongue and groove, or male and female type. There are two acceptable types of joints allowed as follows:

(a) The joints shall be manufactured and sealed in accordance with ASTM C990 (latest edition) and sealed with BN-109 Butyl-Nek Sealant by Henry Company or approved equal.

(b) The joints shall be manufactured and sealed in accordance with ASTM C443 (latest edition) and sealed with a rubber gasket.

(b) All exterior joints regardless of type shall be sealed with RU 116 Rubr-Nek External Joint Wrap, 6-inches wide by Henry Company or approved equal.

5. Holes in manhole bases to receive sewer pipes shall be precast at the factory at required locations and heights. Knocking out of holes in the field will not be permitted. Coring will only be permitted with approval of CITY when unknown field conditions arise.

6. Holes in precast bases to receive sewer pipes shall be provided with flexible manhole connectors of high quality synthetic or natural rubber and conform to ASTM C923. Approved products are ALOK-EX-CEL by ALOK Products, Inc. or KOR-N-SEAL by NPC, Inc. or approved equal.

7. Manhole inverts shall be constructed of 4,000 psi concrete in accordance with details on Drawings and shall have the same cross section as the invert of the sewer with which they connect. Invert shall be carefully formed to required size and grade by gradual and even changes in sections. Changes in direction of flow

through sewer shall be made to a curve with as large a radius as size of manhole will permit.

8. Lift inserts must be integrally cast into the structures. Holes will not be permitted to penetrate the entire wall thickness.

9. Manholes Connecting to Existing System

   a) When connecting a proposed sewer line to an existing sewer line, the existing line shall be cut and a new manhole with solid base shall be installed and reconnected to the existing sewer pipe upstream and downstream in accordance with this specification.

   b) Invert of the new line must be higher than springline of existing pipe if possible.

   c) A CITY inspector must be present when cutting the existing pipe..

   d) Doghouse manholes are not permitted.

10. Manhole Corings

   a) The DEVELOPER shall be responsible for performing manhole corings.

   b) The coring must not be backfilled until approved by the CITY inspector.

   c) Failure, for any reason, to have the CITY inspector approve the coring will cause all work to be halted until the cored manhole is excavated and the rubber boot exposed.

   d) Cores for “future development” or “future tie-ons” are only allowed when installed with a rubber boot, 10 feet of ductile iron pipe, and a mechanical joint plug.

C. Frames, Covers and Steps

1. Manhole frames, stepsets and covers shall be cast iron conforming to minimum requirements of latest ASTM A-48, for Class 35B Gray Iron Castings. Castings shall be made accurately to required dimensions, fully interchangeable, sound, smooth, clean and free from blisters or other defects. Defective castings which have been plugged or otherwise treated shall not be used. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.

2. Manhole frames and covers shall be of size and location as shown on Drawings. Where manholes are to be located under roads or driveways, whether paved or unpaved, frames and covers shall be equivalent to Neenah Foundry Co., No. R-1642. Where called for on drawings, frames and covers shall be equivalent to Neenah Foundry Co., No. R-1916-F (bolt down).

3. Covers:

a. Watertight manhole covers, where indicated on Drawings, shall be equivalent to Neenah Foundry Co., No. R-1916-F (bolt down). All bolts or screws must be stainless steel.

b. All manholes located outside of the street or the street right-of-way shall have bolt down covers.

c. Contact surfaces of all manhole covers and corresponding supporting rings in rims shall be machined to provide full perimeter contact.

d. Sanitary sewer manhole covers shall have cast on the top in letters 2 inches high, "Sanitary Sewer". Cover shall be Neenah Type "A".

4. Steps: Manhole steps conforming to applicable provision of ASTM C-478 such as "Wedg-Lok" as manufactured by Delta Pipe Products, or plastic steps as manufactured by M. A. Industries, Inc., or approved equivalent, shall be used.

D. Brick used in manhole construction shall be either solid or cored, medium hard or better, Grade SM brick conforming to requirements of ASTM C-32 for sewer and manhole brick.

E. Mortar for brick manhole construction shall be sand-cement mortar composed of one part portland cement to two parts clean sand conforming to ASTM C-144. Twenty pounds of hydrated lime per sack of cement may be added. No retempered mortar shall be used.

F. All manholes with drops of 24 inches or more shall be outside drop manholes. Inside drop manholes are not acceptable. All drop manholes shall include all exterior drop pipe additions to standard manholes complete with drop pipe encasement, excavation, and foundation cushion. All outside drop pipe materials to be ductile iron, including one (1) joint of ductile iron pipe entering the manhole.

PART 3 EXECUTION

3.01 MANHOLES

A. Manhole bases shall be placed on 6-inch bed of foundation stone to required elevation.

B. Joints of precast sections shall be sealed with approved sealant. After joint has been made, joint opening shall be sealed with grout. Grout shall be applied from both sides of joint and shall be struck smooth and flush on the inside.

C. After installation of pipe to proper grade and alignment, make required seal of pipe and manhole base and formed inverts in accordance with Specifications and as shown on Drawings.

D. Manhole shall have a minimum of 0.2' (2/10') fall, measured from inlet to outlet.

E. Install manhole frames and covers in accordance with Specifications and as shown on Drawings.

F. Backfilling of manhole in accordance with Section 02225 (Earthwork for Utilities).

G. Manholes are required to be installed at the following locations:

1. At the end of each line.

2. At all changes in grade, line size, or alignment.

3. At distances not greater than 400 feet.

4. At any location to assure the change in horizontal alignment is never less than 90°

H. Layout of manholes that connect to the existing system shall comply with items 3.01 A-G above as well as Details. Sewer lines must be properly plugged before being cut and a pump shall be provided to divert sewage from the manhole directly upstream of the cut line to a downstream manhole. BYPASSED SEWAGE SHALL NOT BE DIRECTED ONTO THE GROUND OR INTO ANY RECEIVING STREAMS.

3.02 INSPECTION

A. After completion of sanitary sewer systems, all manholes shall be visually inspected to insure all joints are slated, all lift holes are grouted, and all inverts are properly constructed. Insure all joints are properly seated, inverts are properly constructed, and pipe to manhole connections are installed per manufacturer's recommendations.

B. Vacuum Testing

1. Each manhole shall be tested immediately after assembly and prior to backfilling as defined by ASTM C1244 *Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test*.

2. All lift holes shall be plugged with an approved non-shrink grout.

3. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.

4. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations.

5. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than 60 seconds for 48" diameter, 75 seconds for 60", and 90 seconds for 72" diameter manholes.

6. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

C. The system will not be accepted by the CITY until all manholes pass a vacuum test.

END OF SECTION

SECTION 02602

COATINGS FOR EXISTING MANHOLES AND WASTWATER STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This specification covers the materials and application of an epoxy filler-surfacer, a fast setting cementitious substrate resurfacer, an epoxy primer/sealer, a corrosion-resistant epoxy lining, and an elastomeric fiber reinforced urethane chimney seal for protection of existing municipal wastewater manholes and wet wells subject to water infiltration, corrosion and erosion.

B. All products required to complete this application may be provided by Corrosion Specialties, Inc. and all manufacturer's recommendations, specifications and installation requirements must be adhered to.

C. The products detailed in this specification shall be used to protect existing concrete manholes, steel rings and covers, wet wells, lift stations and other wastewater concrete infrastructure involved in municipal wastewater collection and treatment.

D. The scope of work shall include the following:

1. Surface preparation in accordance with section Part 3.0 of this specification.

2. Filling of all voids and bug holes with an epoxy filler-surfacer or a cementitious substrate resurfacer.

3. Grouting of joints and around pipes with a fast setting cementitious substrate resurfacer.

4. Application of a 4.0 mil epoxy primer/sealer.

5. Application of a 50.0 mil thick epoxy corrosion/erosion resistant barrier.

6 Sealing of chimney area in manholes to stop infiltration at frame and grade ring juncture.

E. The following wastewater structures shall be coated in accordance with specification 02602 or 02603:

1. All wetwells.
2. All manholes receiving forcemain discharge.
3. All manholes immediately upstream of wetwells.
4. All drop manholes.

PART 2 PRODUCTS

2.01 MATERIALS

A. The epoxy filler-surfacer shall be the Carboline Carboguard 501 epoxy filler or the Sauereisen F-121 Substrate Resurfacer for sealing and filling porous and irregular cementitious surfaces.

B. The fast setting cementitous grout for the joints shall be the Sauereisen F-121 Substrate Resurfacer.

C. The epoxy primer/sealer shall be the Carboline Carboguard 671 epoxy primer.

D. The chemical-resistant epoxy lining shall be the Carboline Plasite 4500S Epoxy. The lining shall be a solvent, VOC and HAPS free epoxy system designed specifically for protection of concrete in municipal wastewater collection and treatment systems. All epoxy systems must have proven successful applications in the wastewater industry and must have successfully passed the Redner Test.

E. In manholes, upon completion of cementitious and/or epoxy lining systems on the interior walls, an elastomeric lining composed of fiber reinforced, asphalt modified urethane shall be applied to the interior of the chimney area from the top of the manhole lid frame and down past the grade ring. The elastomeric lining shall be the Sauereisen F-88 Chimney Seal.

PART 3 EXECUTION

3.01 AREA PREPARATION

A. Temperature of Working Area - Optimum temperature for handling and applying the materials is 60-80°F. Store material within the 60°F to 80°F range for 48 hours prior to use. At material temperatures below 60°F, the application becomes more difficult and curing is retarded. At temperatures above 95°F material working time is reduced.

B. Application of epoxy products in direct sunlight and/or with rising surface temperatures may result in blistering of the materials due to expansion of entrapped air or moisture in the concrete.

C. Concrete surfaces that have been in direct sunlight must be shaded for 24 hours prior to application and remain shaded until the initial set has taken place. When the surface temperatures are rising, it may be necessary to postpone the application or apply during the cooler evening hours.

D. Steel surfaces must be abrasive blasted in accordance with SSPC-SP6 Commercial Blast Cleaning. Concrete surfaces must be abrasive blasted in accordance with SSPC-SP13 Surface Preparation of Concrete to remove all laitance, loose or damaged concrete, oils greases, chemical contaminants and previously applied coatings or sealers. Suitably prepared concrete should have a

uniform surface texture resembling coarse sand paper. The blasting abrasive shall be a low free silica product such as Dupont Starblast.

3.02 APPLICATION

A. All specified products must be installed in strict accordance with installation instructions detailed on manufacturer's product data sheets and other pertinent data, which shall be included as submittal data.

B. All specified products must be installed by qualified and trained applicators in accordance with this specification.

3.03 CONTRACTOR PRE-QUALIFICATION

Contractor qualification and training is available from Corrosion Specialties, Inc. All bidders must obtain written confirmation from Corrosion Specialties, Inc. that they are qualified to install the specified products required in this specification and include this written confirmation when requested by the owner.

3.04 CLEAN-UP

Consult product data sheets for all information pertaining to clean-up of specified products.

3.05 SETTING/CURING

Setting and curing of specified products shall be in strict accordance with instructions detailed on manufacturer's product data sheets.

3.06 SHELF LIFE

Consult manufacturer for specific details on shelf life and provide documentation that all products are within the shelf life limitations specified by the manufacturer.

3.07 CAUTION

Conform to all warnings on product Material Safety Data Sheets and consult container label caution statements for any hazards in handling these products.

END OF SECTION

SECTION 02603

COATINGS FOR NEW MANHOLES AND WASTEWATER STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This specification covers the materials and application of an epoxy filler-surfacer, a fast setting cementitious substrate resurfacer, an epoxy primer/sealer, a corrosion-resistant elastomeric polyurethane lining, and an elastomeric fiber reinforced urethane chimney seal for protection of municipal wastewater manholes and wet wells subject to water infiltration, corrosion and erosion.

B. All products required to complete this application may be provided by Corrosion Specialties, Inc. and all manufacturer's recommendations, specifications and installation requirements must be adhered to.

C. The products detailed in this specification shall be used to protect new concrete manholes, steel rings and covers, wet wells, lift stations and other wastewater concrete infrastructure involved in municipal wastewater collection and treatment.

D. The scope of work shall include the following:

1. Surface preparation in accordance with Part 3.0 of this specification.

2. Filling of all voids and bug holes with an epoxy filler-surfacer or a cementitious substrate resurfacer.

3. Grouting of joints and around pipes with a fast setting cementitious substrate resurfacer.

4. Application of a 4.0 mil epoxy primer/sealer.

5. Application of a 50.0 mil thick elastomeric polyurethane corrosion/erosion resistant barrier.

6. Sealing of chimney area in manholes to stop infiltration at frame and grade ring juncture.

E. The following wastewater structures shall be coated in accordance with specification 02602 or 02603:

1. All wetwells.
2. All manholes receiving forcemain discharge.
3. All manholes immediately upstream of wetwells.
4. All drop manholes.

PART 2 PRODUCTS

2.01 MATERIALS

A. The epoxy filler-surfacer shall be the Sauereisen F-121 Substrate Resurfacer for sealing and filling porous and irregular cementitious surfaces.

B. The fast setting cementitous grout for the joints shall be the Sauereisen F-121 Substrate Resurfacer.

C. The epoxy primer/sealer shall be the Carboline Carboguard 671 epoxy primer.

D. The chemical-resistant elastomeric polyurethane lining shall be the Carboline Polibrid 705. The linings shall be a solvent, VOC and HAPS free polyurethane system designed specifically for protection of concrete in municipal wastewater collection and treatment systems. All polyurethane systems must have proven successful applications in the wastewater industry.

E. In manholes, upon completion of cementitious and/or elastomeric polyurethane lining systems on the interior walls, an elastomeric lining composed of fiber reinforced, asphalt modified urethane shall be applied to the interior of the chimney area from the top of the manhole lid frame and down past the grade ring. The elastomeric lining shall be the Sauereisen F-88 Chimney Seal.

PART 3 EXECUTION

3.01 AREA PREPARATION

A. Temperature of Working Area - Optimum temperature for handling and applying the materials is 60-80°F. Store material within the 60°F to 80°F range for 48 hours prior to use. At material temperatures below 60°F, the application becomes more difficult and curing is retarded. At temperatures above 85°F material working time is reduced.

B. Application of epoxy and polyurethane products in direct sunlight and/or with rising surface temperatures may result in blistering of the materials due to expansion of entrapped air or moisture in the concrete.

C. Concrete surfaces that have been in direct sunlight must be shaded for 24 hours prior to application and remain shaded until the initial set has taken place. When the surface temperatures are rising, it may be necessary to postpone the application or apply during the cooler evening hours.

D. All structures to receive specified products must be properly designed and capable of withstanding imposed loads. Steel surfaces must be abrasive blasted in accordance with SSPC-SP6 Commercial Blast Cleaning. Concrete surfaces must be abrasive blasted in accordance with SSPC-SP13 Surface Preparation of Concrete to remove all laitance, loose or damaged concrete, oils greases, chemical contaminants and previously applied coatings or sealers. Suitably prepared concrete should have a uniform surface texture resembling coarse sand

paper. The blasting abrasive shall be a low free silica product such as Dupont Starblast.

3.02 APPLICATION

A. All specified products must be installed in strict accordance with installation instructions detailed on manufacturer's product data sheets and other pertinent data, which shall be included as submittal data.

B. All specified products must be installed by qualified and trained applicators in accordance with this specification.

C. All structures shall be coated prior to being installed in ground. The joints shall be coated upon installation.

3.03 CONTRACTOR PRE-QUALIFICATION

Contractor qualification and training is available from Corrosion Specialties, Inc. All bidders must obtain written confirmation from Corrosion Specialties, Inc. that they are qualified to install the specified products required in this specification and include this written confirmation when requested by the owner.

3.04 CLEAN-UP

Consult product data sheets for all information pertaining to clean-up of specified products.

3.05 SETTING/CURING

Setting and curing of specified products shall be in strict accordance with instructions detailed on manufacturer's product data sheets.

3.06 SHELF LIFE

Consult manufacturer for specific details on shelf life and provide documentation that all products are within the shelf life limitations specified by the manufacturer.

3.07 CAUTION

Conform to all warnings on product Material Safety Data Sheets and consult container label caution statements for any hazards in handling these products.

END OF SECTION

SECTION 02645

FIRE HYDRANTS

PART 1 GENERAL

1.01 RELATED WORK

A. SECTION 2660 – Water Distribution System

1.02 REFERENCES

A. AWWA, Section C502 - Dry-Barrel Fire Hydrants (Latest Edition)

PART 2 PRODUCTS

2.01 MATERIALS

A. Hydrants shall be manufactured in full compliance with American Water Works Association Standard for Dry-Barrel Fire Hydrants, 250 psi working pressure, C502, and as herein amended.

B. Hydrants shall be Mueller Super Centurion 250; M & H Style 129-250 psi; see Fire Hydrant Assembly Detail W-7.

C. Hydrants shall be three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.

D. Internal main valve diameter shall be minimum of 5-1/4”.

E. Hydrants shall have name of manufacturer, year manufactured, and nominal valve size in legible, raised letters cast on barrel of bonnet.

F. Dry Top Bonnet

1. Shall be constructed with moisture-proof lubrication chamber, which provides automatic lubrication of threads and bearing surfaces each time hydrant is operated.

2. Assembly shall be comprised of top "O" ring serving as dirt and moisture barrier and a lower "O" ring, which shall serve as a pressure seal.

G. Operating Nut

1. Shall be of regular pentagon shape measuring 1-1/2" point to flat; i.e. National Standard, and shall open by turning counter-clockwise (left).

2. Nozzle caps shall have same cross-section as operating nut and shall come with heavy duty, non-kinking chains.

3. Chains shall be securely affixed to hydrant upper barrel and permit free turning of caps.

H. Traffic Design

1. Hydrant barrel sections shall be connected at groundline in a manner that will prevent damage to hydrant when struck by vehicle.

2. Main valve rod sections shall be connected at groundline by frangible coupling.

3. Standpipe and groundline safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing top operating components and top section of hydrant standpipe.

I. Main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.

J. Main Valve Seat

1. Shall be of bronze and assembly into hydrant shall involve bronze to bronze thread engagement.

2. Two (2) "O" ring seals shall be provided as positive pressure seal between the bronze seat ring and shoe.

3. Valve assembly pressure seals shall be obtained without employment of torque compressed gaskets.

4. Hydrants shall be designed to allow removal of all operating parts through hydrant barrel by means of single, lightweight disassembly wrench without excavation.

K. Drain

1. Mechanism shall be designed to operate automatically with the operation of main valve and shall allow a momentary flushing of drain ports.

2. Minimum of two (2) internal and two (2) external bronze lined drain ports shall be required in main valve assembly to drain hydrant barrel.

3. Inlet connection shall be cast iron inlet elbow and shall have 6" mechanical joint connection.

4. Barrel extension sections shall be available in 6" increments complete with rod, extension coupling and necessary flanges, gaskets and bolts so that extending hydrant can be accomplished without excavating.

5. No lead will be allowed in nozzle installation.

6. Hydrants shall be tested in strict accordance with AWWA C502 at supplier's expense. Certificate of compliance shall be furnished to OWNER upon request.

L. Fire hydrants shall have two 2-1/2" diameter hose connections and one pumper connection. Standard hose threads shall be provided.

2.02 SPARE PARTS

A. DEVELOPER/CONTRACTOR shall provide the CITY OF BALDWIN with five (5) breakaway repair kits for each type of hydrant provided.

PART 3 EXECUTION

3.01 SETTING HYDRANTS

A. Hydrants to be installed so the finish grade is at the hydrant bury line.

B. Extension required to bring hydrant to proper grade shall be furnished and installed by DEVELOPER/CONTRACTOR at his expense.

B. Fire hydrant assembly shall consist of the ductile iron hydrant tee, gate valve, ductile iron lead pipe, and hydrant. Pipe restrainers must be used to restrain assembly. Pipe restrainers to be anchor coupling type or Grip Ring Pipe Restrainers as manufactured by Romac Industries, Inc. or approved equivalent. **PVC IS NOT ALLOWED FOR HYDRANT ASSEMBLY**.

C. Hydrants shall be installed with a maximum distance between the hydrants of 500 feet, and at intersections.

D. Hydrants shall be installed with a minimum supply line of 6” in diameter.

3.02 PAINTING, COATING AND LUBRICATING

A. Iron parts of hydrant shall be thoroughly cleaned inside and outside.

B. Unless otherwise stipulated or directed, surface shall be coated or painted with, or dipped in, an asphalt or bituminous base paint or coating, except for the exterior portion above the groundline.

C. Hydrants shall be covered with two (2) coats of paint, the first being allowed to dry thoroughly before applying second coat.

D. Exterior of hydrant valve above finished groundline shall be thoroughly cleaned and painted in shop with two (2) coats of Koppers Primer 621, or approved equivalent.

E. Following installation, hydrants shall be painted with two (2) field coats of enamel paint to CITY OF BALDWIN specifications.

F. Final hydrant color shall be red.

END OF SECTION

SECTION 02660

WATER DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. WORK covered by this Section consists of furnishing and installing water distribution pipes and appurtenances, including, but not limited to, reaction blocking, testing, and disinfection.

1.02 RELATED WORK

A. Section 02225 - Earthwork for Utilities

B. Section 02665 - Water Service Connections

1.03 REFERENCES

The latest version of the following referenced standards shall be used.

A. American Society for Testing and Materials (ASTM), Annual Book Standards.

1. ASTM D 2122, Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

2. ASTM F 477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

B. American Water Works Association (AWWA) Standards.

1. AWWA C104, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. AWWA C110, Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.

3. AWWA C111, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

4. AWWA C151, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or other Liquids.

5. AWWA C153, Standard for Ductile-Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in., for Water Service.

6. AWWA C509, Standard for Resilient – Seated Gate Valves for Water Supply Service.

7. AWWA C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.

8. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

9. AWWA C605, Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

10. AWWA C651, Standard for Disinfecting Water Mains.

11. AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.

C. *Minimum Standards for Public Water Systems*, Georgia Environmental Protection Division

1.04 DELIVERY, STORAGE, AND HANDLING

A. DEVELOPER/CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into work.

B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.

1. Pipe shall not be unloaded by rolling or dropping off trucks.

2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground.

C. Unload material at site of work, near place where it will be placed in trench.

1. Materials shall be placed for least interference with traffic.

2. Provide signs, lights, and barricades as necessary to protect public.

D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.

1. Keep interior of pipe, fittings, and valves, free of dirt or foreign matter at all times.

2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.01 GENERAL

All water distribution piping mains shall be ductile iron or PVC as allowed in this section. Ductile iron shall be utilized under all roads, pavement, culverts, creeks, and at any location required at the City's discretion. All materials used and come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61). All materials utilized in the distribution systems are to be new.

Depending on laying conditions and the City's future water system plans in the area, DIP may be required on any project at the City's discretion.

2.02 DUCTILE IRON PIPE

A. Shall conform to latest requirements of AWWA C151.

B. Shall be cement mortar lined in accordance with AWWA C104 standard thickness.

1. Unless otherwise specified, pipe shall have push-on compression type joints conforming to AWWA C111 or AWWA C153 (Latest Editions).

2. Minimum pressure class shall be 350 psi.

C. Ball-Joint Pipe (DIP) - Major Creek and River Crossings

1. Shall be manufactured for river crossing applications.

2. Joints shall be boltless.

3. Joints shall be restrained.

4. Joint shall provide up to 15° deflection, and rated for 350 psi.

D. Restrained Joint Pipe (DIP) - Horizontal Directional Drilling (HDD)

1. To be utilized for difficult area to open cut and Major Creek and River Crossings

2. Shall be manufactured for HDD applications.

3. Joints shall be interlocking and boltless.

4. Joints shall be restrained.

5. Joint shall provide up to 5° deflection, and rated for 350 psi.

6. Shall be “Flex-Ring” by ACIPCO or “TR-Flex” by U. S. Pipe, or approved equal.

E. Restrained Joints, Push On Type – DIP

1. Restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket” by U. S. Pipe.

2. Joint preparation and installation shall be in accordance with manufacturer’s recommendations.

F. Retainer Glands for Restraint - DIP

1. Retainer gland restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, or approved equal.

2.03 PLASTIC PIPE (PVC)

A. 3" Diameter and Smaller

1. Polyvinyl Chloride (PVC) pipe 3" diameter and smaller shall conform to requirements of ASTM D-2241.

2. Pipe shall be pressure Class 315 (SDR 13.5).

3. PVC plastic extrusion compound shall meet requirements of ASTM D-1784 for Class 12454-B (PVC 1120).

4. Pipe and couplings shall bear National Sanitation Foundation Testing Laboratories, Inc., seal of approval for potable water use.

B. 4" Diameter and Larger

1. Polyvinyl chloride (PVC) pipe 4" diameter and larger shall meet requirements of AWWA C-900 (latest edition).

2. Pipe shall be a minimum Pressure Class 235 (DR 18) with outside diameter (OD) dimensions of cast iron pipe. If the applicable working pressure is within 20 p.s.i. of the pipe’s Pressure Class, a higher pressure class is required. Depending on laying conditions and the City’s future water system plans in the area, DIP may be required on any project at the City’s discretion.

3. Joints

a) Shall be made with elastomeric gaskets.

b) Bell end pipe using elastomeric gaskets shall meet requirements of ASTM D2122.

c) Elastomeric gasket couplings shall meet requirements of AWWA C-900 (latest revision) for the specified pipe class and shall meet the requirements of ASTM F-477.

4. Marking

a) Provide marking as specified in AWWA C-900.

2.04 CAST AND DUCTILE IRON FITTINGS

A. Fittings for ductile iron pipe and PVC pipe shall be cast or ductile iron and shall conform to requirements of AWWA C110 or AWWA C153 and shall be cement mortar lined in accordance with AWWA C104 standard thickness.

B. Joints shall conform to AWWA C111.

C. Fittings shall be mechanical joint unless otherwise specified on Drawings.

D. Gaskets for PVC pipe shall be duct tip transition type compatible with type of pipe used.

2.05 RESTRAINED JOINTS-DIP

A. Push-on application-Restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket”by U. S. Pipe.

B. Retainer gland restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, or approved equal.

C. Joint preparation and installation shall be in accordance with manufacturer’s recommendations.

2.06 GATE VALVES

A. Shall conform to requirements of AWWA C509 for resilient seated gate valves, iron body, with bonded epoxy coating conforming to AWWA C550.

B. Shall be designed for 250 psi working pressure and 500 psi hydrostatic test pressure.

C. Accepted manufacturers are Mueller, and U.S. Pipe and Foundry Co.

D. Shall be of iron body, bonded epoxy, and shall have non-rising bronze stem, and shall be wrench operated.

E. Valves shall open by turning counter-clockwise, and operating nuts shall be standard two inches square.

F. Suitable stem guides shall be provided, where required.

G. Shall be furnished with mechanical joint suitable for connection to pipe into which it will be installed for buried service.

H. Small Gate Valves: Valves smaller than 3 inches shall conform to level of quality and manufacturing standards established for valves 3 inches and larger by respective AWWA Standards.

I. Gate valves shall be installed at a maximum spacing of 500 linear feet in commercial areas, at a maximum spacing of 800 linear feet in medium density, non-commercial areas, at a maximum spacing of 1000 linear feet in all areas. Valves shall be installed at a minimum of 3 valves per 3-way tees intersections, and at a minimum of 4 valves per 4-way crosses or intersections. Additional valves may be required at the CITY's discretion.

2.07 PRESSURE REDUCING VALVES

A. Pressure Reducing Valves and vaults shall be designed and sized by the DEVELOPER's engineer, and reviewed by the CITY. Pressure Reducing Valves shall be as manufactured by Cla-Val. Some installation may require high and low flow set-ups.

B. Precast vaults for each pressure reducing valve must be supplied and installed. The vault must be sized for each application so as to allow ample working room in the vault. Contractor is to provide shop drawings of the proposed units for approval by CITY and ENGINEER at the Preconstruction Conference.

2.08 AIR RELEASE VALVES

A. Shall be cast iron body with stainless steel (ASTM A240) float and synthetic seat equal to Crispin PL 10, Type N.

B. Orifice size shall be as follows:

MAXIMUM OPERATING PRESSURE (PSI)						
	50	100	150	200	250	300
ORIFICE	$\frac{5}{16}$"	$\frac{5}{16}$"	$\frac{1}{4}$"	$\frac{3}{16}$"	$\frac{5}{32}$"	$\frac{1}{8}$"

For general use a $\frac{3}{16}$" orifice will be adequate. However, DEVELOPER/ CONTRACTOR is to verify actual size with CITY prior to installation.

2.09 AIR/VACUUM VALVES

A. Shall be cast iron body with stainless steel (ASTM A240) trim and float equal to Crispin AL20 or approved equivalent.

B. Orifice size shall be 2” diameter.

C. Internal parts shall be stainless steel (ASTM A240) or bronze.

2.10 VALVE MARKERS

A. Shall be furnished with each gate valve and air release/vacuum valve installed as indicated on the drawings, with exception of fire hydrant valves.

B. Marker shall be reboundable, flexible post as per *USA Blue Book* the RHINO 3-RAIL marking post, color blue, 66”, catalogue no. 70456.

C. Label Decal shall be white with blue text, 2-7/8” X 14”, reading WARNING WATER VALVE. Decal shall also bear the name, CITY OF BALDWIN-PHONE NUMBER 706-778-6341.

2.11 VALVE BOXES AND COVERS

A. Shall be provided with valves.

B. Shall be of adjustable screw type, of length required with a minimum 6" of adjustment allowed, and installed as shown on standard details.

C. Shaft shall be 5 inch diameter with base to be minimum of 8 inch diameter by 9-inch height inside.

D. Base size and extension piece shall be as required for each individual size of valve and depth.

2.12 TAPPING VALVES

A. DEVELOPER/CONTRACTOR is to submit the manufacturer, size, and type of mechanical joint tapping sleeve and valve to the CITY for review and approval prior to installation.

B. Tapping machines and competent supervision shall be provided for making of taps. All taps shall be made in the presence of the CITY representative.

C. Tapping sleeves shall be properly sized to fit existing pipe and shall be of split sleeve type with ends suitable for connection into pipeline into which it will be installed.

D. Largest tap allowed shall be one size smaller than the existing main. The new water main may be increased in size beyond the installed tapping sleeve and valve.

E. Valves furnished with sleeves shall conform to requirements herein above for gate valves, except for modifications required to permit use of full size cutter through valves.

F. Outlet of valves shall be mechanical joint for joining with water mains.

G. After tap is completed, the “cut out” section of pipe or “coupon” shall be tagged, labeled as to date and location, and submitted to Water Department.

H. Tapping sleeves shall be pressure tested immediately after installation as per the testing requirements of this section.

2.13 DETECTION TAPE AND WIRE

A. Detector marking tape shall be non-metallic and shall be installed minimum 2 feet above the pipe. Tape shall be highly visible and minimum 2 inches wide. Lettering shall read "Caution: Buried Water Line".

B. FOR PVC PIPE ONLY-Detection wire shall be size #12 AWG, installed the entire length of the piping. Wire shall be installed minimum 2 feet above the pipe and properly connected to fittings and valves so line can be relocated with a pipe finder after burial.

PART 3 EXECUTION

3.01 ALIGNMENT AND GRADES

A. Depth of Pipes

1. Shall be 48 inches measured from finished grade to top of pipe unless otherwise specified.

2. Where obstructions are encountered, depth may be greater than 48 inches.

B. Valves

1. Shall be installed with stems vertical.

C. Pipe Curvatures

1. Maximum horizontal or vertical permissible deflection at joint shall be 5 degrees.

3.02 INSTALLING PIPE

A. General

1. In accordance with Section 7.2.0.g of Minimum Standards for Public Water Systems, all water line installation shall be conducted in compliance with all applicable requirements of state DOT, municipality and/or county road departments, and railroads.

2. Curbing must be installed prior to installing any waterlines.

3. Trenches must be dry. Pipe and appurtenances shall be installed only when trench conditions are suitable

4. Proper implements, tools, and facilities shall be provided by DEVELOPER/CONTRACTOR for safe and convenient performance of the work.

6. Separation of Water and Sewer Mains

a) Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis, must be approved by the CITY) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

b) Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so that both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required. When local conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling. When water mains cross under sewers, additional measures shall be taken by providing: a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main; adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains; that the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer; and, both the sewer and the water main shall be constructed of water pipe materials and subjected to hydrostatic tests, as

prescribed in this document. Encasement of the water pipe in concrete shall also be considered.

B. Installation

1. Lower pipe, fittings, valves, and hydrants carefully into trench piece by piece by means of derrick, ropes, or other suitable tools or equipment.

2. Prevent damage to water main materials and protective coatings and linings.

3. Do not drop or dump water line materials into trench.

4. Carefully examine pipe and fittings for cracks and other defects while suspended above trench immediately before installation in final position.

   a) Defective pipe or fittings shall be clearly marked and shall be removed from site.

5. Clean bell and spigot ends of each piece of pipe thoroughly before pipe is laid.

6. Prevent foreign material from entering pipe while it is being placed in line.
   a) Provide protective covering for ends of pipe until connection is made to adjacent pipe, if necessary.

   b) No debris, tools, clothing, or other materials shall be placed in pipe during laying operations.

7. As each length of pipe is placed in trench, spigot end shall be centered in bell and pipe forced home and brought to correct line and grade.

   a) Pipe shall be secured in place with approved backfill material tamped around it.

   b) Precautions shall be taken to prevent dirt from entering joint space.

8. Open ends of pipe shall be closed by watertight plug, or other means approved by the CITY, at times when pipe laying is not in progress.

   a) If water is in trench, plug shall remain in place until trench is pumped completely dry. Water shall not be allowed to run into pipe at any time during construction.

9. Lay pipe with bell ends facing in direction of laying.

   a) Where pipe is laid on grade of 10 percent or greater, laying shall start at bottom and shall proceed upward with bell ends of pipe upgrade.

3.03 CUTTING PIPE

Cut pipe for inserting valves, fittings, or closure pieces in neat manner without damage to pipe or lining and so as to leave smooth end at right angles to axis of pipe.

3.04 DETECTION OF NON-FERROUS PIPE

See part 2.13.

3.05 JOINTING

A. Jointing of pipe, fittings, and valves shall be made in strict compliance with manufacturer's printed instructions.

B. Mechanical Joints

1. Thoroughly clean outside of spigot and inside of bell prior to installation.

2. Clean gasket.

1. Tighten nuts with torque limiting wrench.

4. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure.

C. Push-On Joints

1. Furnish and install adapters if required to join bells and spigots of different sizes.

2. Thoroughly clean inside of bell and outside of spigot end prior to installation.
3. Insert and lubricate gasket using lubricant furnished or recommended by pipe manufacturer.

4. Spigot end of pipe shall be entered into socket with care used to keep joint from contacting ground.

5. Complete joint by forcing plain end to bottom of socket with forked tool or jack-type tool.

3.06 SETTING VALVES AND FITTINGS

A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for cleaning, laying and joining pipe.

B. Valves shall be set plumb and a valve box shall be provided for every valve.

1. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.

2. **FOR INSTALLATION WHERE THERE ARE ROADSIDE DITCHES, VALVES AND VALVE BOXES SHALL BE PLACED ON THE BACK SIDE OF THE DITCH AT LEAST FIVE (5) FEET FROM THE CENTERLINE OF THE DITCH.**

C. Backfill around valves shall be carefully tamped in 6 inch layers for full depth of trench with valve box in place.

D. Provide concrete pad at surface as indicated on STANDARD DETAILS.

3.07 ANCHORAGE

A. Plugs, caps, tees, bends, and valves, unless otherwise specified, shall be provided with reaction blocking. Concrete reaction blocking shall conform with these specifications and the applicable standard details.

B. Concrete reaction blocking shall conform with these specifications and the applicable standard details.

C. Reaction blocking shall be concrete, having a compressive strength of not less than 3,000 psi after 28 days. "Sackcrete" shall not be used.

D. Blocking shall be placed between solid, unexcavated earth and fitting to be anchored; area of bearing on pipe and on ground in each instance shall be that shown on DRAWINGS.

E. Blocking shall, unless otherwise shown or directed, be so placed that pipe and fitting joints will be accessible for repair.

F. Metal harness of tie rods or clamps of adequate strength to prevent movement may be used to compliment concrete blocking if approved by the CITY.

G. Steel rods or clamps shall be galvanized or bituminous coated.

3.08 CONNECTION TO EXISTING MAINS

A. NO CONNECTIONS TO EXISTING WATERMAINS SHALL BE MADE WITHOUT THE PRESENCE OF CITY OF BALDWIN PERSONNEL.

B. DEVELOPER/CONTRACTOR shall coordinate with the CITY OF BALDWIN regarding connections to existing mains.

B. Connection to existing mains shall be made at such time as to minimize disruption of water service to public.

C. Connections to existing mains shall be made using proper fittings and specials to suit actual conditions.

D. Existing pipes, which are cut or damaged by DEVELOPER/CONTRACTOR, shall be repaired, reconnected, and returned to service in equal or better condition.

3.09 STREAM and UTILITY CROSSINGS

A. Pipe shall be placed beneath streambeds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.

1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.

2. Provide minimum of 48 inches under streambeds or ditches, unless approved by Engineer in writing.

3. Provide minimum of 6 inch earth or sand cushion between proposed water line and any other utility or structure or as indicated on drawings, unless utility is sewer, then 18 inches of vertical separation is required between water lines and sewer lines.

B. Where water lines are installed below free flowing streams, the DEVELOPER is responsible for adequate pipeline design of each crossing on a case by case basis subject to the CITY's review. The Developer's Engineer shall consider the soils, creek flow, pressure, topography, thrust restraint, construction techniques allowed, etc. in order to design and specify appropriate layout and pipe joints.

C. The DEVELOPER shall be responsible for all and any necessary permitting by the all authorities having jurisdiction for stream crossings or crossing of state waters including but not limited to EPD, County, and the Army Corps of Engineers.

3.10 HYDROSTATIC TESTS

A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600 and or C605.

B. General Procedure

1. Furnish and install corporation stops at high points on line to release air as line is filled with water.

2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.

3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not less than 150 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not

exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.

a) Test pressures shall be as directed by the CITY.

b) Test shall be conducted for a minimum of 2 hours.

b) Pressure shall not vary by more that 5 psi during test.

4. Testing Allowance.

a) The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain ±5 psi of the test pressure.

b) The maximum allowable makeup water shall be based on the following formula:

$$L = \frac{S \times D \times (P^{0.5})}{148{,}000}$$

Where L is the testing allowance of makeup water in gallons per hour; S is the test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.

c) No pipe installation shall be accepted if the amount of make up water required exceeds the amount determined in the formula above.

5. Locate, remove, and replace any defective pipe, valves, fittings, or hydrants.

6. Repeat tests until results are satisfactory to the CITY.

3.11 DISINFECTION

A. Pipe, fittings, valves, and appurtenances which have been exposed to contamination by construction shall be thoroughly cleaned, chlorinated, drained, and flushed in accordance with AWWA Specification C651, the Continuous Feed Method and EPD Minimum Standards for Public Water Systems.

B. Procedure

1. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.

2. The “tablet method” of disinfection consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete. In accordance with EPD Minimum Standards for Public Water Systems, the tablet method is not allowed.

3. For the Continuous Feed Method, water entering the new main shall receive a dose of chlorine fed at a constant rate so that the water will have a concentration not less than 25 mg/L free chlorine. This shall be done within 10-feet of the beginning of the main. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances. At the end of the 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. Re-chlorination is required if required results are not obtained on all samples.

4. After 24 hour retention period, flush chlorinated water from line until chlorine concentration of water leaving main is no higher than that generally prevailing in existing system or that is acceptable for domestic use

5. Disposal of the heavily chlorinated water shall be in accordance with AWWA Standard C651. The environment to which this water will be discharged shall be inspected. If there is any question that the water will damage the environment, a reducing agent shall be used to neutralize the chlorine.

6. In accordance with AWWA C651, cross connection / backflow prevention measures shall be taken before and during disinfection of constructed water mains to prevent backflow into active portions of the distribution system or into sections that have already been disinfected but not yet placed into service.

7. DEVELOPER/CONTRACTOR shall have sample analyzed by a certified laboratory.

C. Repeat disinfection procedures until bacteriological analysis results are acceptable to the CITY OF BALDWIN.

END OF SECTION

SECTION 02665

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

WORK covered by this Section consists of furnishing all materials and installation of all service connections to the water system.

1.02 RELATED WORK

A. Section 02660 - Water Distribution System

1.03 REFERENCES

A. AWWA C700- Cold Water Meters- Displacement Type, Bronze Main Case

B. AWWA C701- Cold Water Meters- Turbine Type, for Customer Service

C. AWWA C702- Cold Water Meters- Compound Type

D. ASTM B88- Standard Specification for Seamless Copper Water Tube

E. AWWA C800 -Underground Service Line Valves and Fittings

F. AWWA C510- Double Check Valve Backflow-Prevention Assembly

G. AWWA C511- Reduced Pressure Principle Backflow-Prevention Assembly

PART 2 PRODUCTS

2.01 SERVICE TUBING

A. Up to 2" diameter shall be copper tubing conforming to ASTM designation B88 for Type "K". Soft temper or AWWA 78-CR Type "K". Tubing may be in 20-foot straight lengths or 60-100 foot coils.

B. Services greater than 3" diameter shall be ductile iron, as specified in Section 02660.

C. Tubing O.D. shall be compatible with accessories specified herein below.

2.02 WATER METERS

Water meters shall read in U.S. gallons in 100’s gallons, and shall conform to AWWA Standard C700, C701, or C702 depending on the application. All water meters shall be manufactured by Neptune radio read compatible with the City’s current meter reading program and devices. Common meters models are as follows:

A.	1” Positive Displacement	Neptune
B.	2” Positive Displacement	Neptune
C.	2”-4” Compound	Neptune
D.	5/8” x ¾” Positive Displacement	Neptune

2.03 METER/BACKFLOW PREVENTER BOXES

Meter/Backflow Preventer boxes shall be as follows:

For Non-Traffic Areas for a 1” Meter Box and 1” Back Flow Preventer Box

A. Box shall Model #1015- Polyplastic be by Carson Industries, LLC or approved equal.
B. Color shall be black.
C. Inside base dimensions = 19 1/2” x 14 1/8”, depth = 12 1/8”, Top = 17” x 12”.
D. Cover shall be cast iron lid with appropriate size hole for touch read pad.

For Traffic Loaded Areas for a 1” Meter Box

A. Box shall Model #1118- Polymer Concrete be by Carson Industries, LLC or approved equal.
B. Shall be rated for H20 Loading.
C. Inside base dimensions = 16 5/8” x 9 3/4”, Depth = 12”, Top = 20 1/4” x 13 3/8”.
D. Cover shall be steel lid with appropriate size hole for touch read pad.

For Non-Traffic Areas for a 2” Meter Box and 2” Back Flow Preventer Box

A. Box shall Model #1324- Polyplastic be by Carson Industries, LLC or approved equal.
B. Color shall be black.
C. Inside base dimensions = 28 5/16” x 19 1/2”, depth = 12”, Top = 25 3/8” x 15 15/16”.
D. Cover shall be cast iron lid with appropriate size hole for touch read pad.

For Traffic Loaded Areas for a 2” Meter Box, 2” Back Flow Preventer Box, and 1” Back Flow Preventer Box

A. Box shall Model #H1730- Polymer Concrete be by Carson Industries, LLC or approved equal.
B. Shall be rated for H20 Loading.
C. Inside base dimensions = 28 1/4” x 15 1/4”, Depth = 12”, Top = 32 1/4” x 19 1/4”.
D. Cover shall be steel lid with appropriate size hole for touch read pad.

For meters larger than 2-inch, solid bottom concrete vaults with locking aluminum hatches shall be specified and sized appropriately to house the proposed meter and backflow preventer.

2.04 BACKFLOW PREVENTERS

A. Backflow preventers shall be Watts Series 007, Series 709 or approved equal. Each shall be installed in separate box or vault where possible. Reduced Pressure Zone types (RPZ) shall be required on hazardous-potential connections; these Backflow preventers shall be Watts Series 009, series 909 or approved equal. All layout and installations shall be approved by City prior to installation.

2.05 ACCESSORIES

A. All service line valves and fittings shall be compatible with pipe and service tubing furnished, and conform to AWWA Standard C800.

B. Cut-off valve shall be WATTS Series WBV brass ball valve or approved equal.

C. Curb Stops shall be by Ay McDonald, B Series with Pad-locking wings with appropriate coupling connections.

2.06 FIRE LINE CONNECTIONS

A. Size of fire line connection shall be determined by design engineer. All connections shall be installed with Double Check Detector Assemblies

B. Double Check Detector Assemblies shall be Watts Series 007DCDA, Series 709DCDA or approved equal. Each shall be installed in separate box or vault where possible. Reduced Pressure Zone types (RPZ) shall be required on hazardous-potential connections; these Double Check Detector shall be Watts Series 009RPDA Series 909RPDA or approved equal. All layout and installations shall be approved by City prior to installation.

PART 3 EXECUTION

3.01 GENERAL

A. All new service connections shall be metered.

B. Service connections shall be installed in the same manner as water distribution mains, and in accordance with Section 02660 of these Specifications, except for depth which shall be 24 inches at the meter box.

C. Meter boxes shall be placed as shown on the construction drawings or as directed by CITY.

D. Service connections shall be made where directed by the CITY.

E. Jack and bore service tubing under pavement.

F. The backflow preventer is to be located on the customer side of the meter. Installations are to be plumb.

G. Any pipe, solder, or flux used in the installation or repair of water lines must be lead free. Pipes and fittings must not contain more than 8.0% lead, and solders and flux must not contain more than 0.2% lead.

H. All meters, fittings, piping and accessories shall be approved by the National Sanitation Foundation (NSF) with the seal of approval for potable water.

I. CONTRACTOR shall keep a log of all installations, locations, and meter serial numbers.

J. Disinfection- Pipe, fittings, valves, and appurtenances which have been exposed to contamination by construction shall be thoroughly cleaned, chlorinated, drained, and flushed in accordance with AWWA C651.

END OF SECTION

SECTION 02732

SANITARY SEWER FORCE MAINS

PART 1 GENERAL

1.01 RELATED WORK

A. Section 02225 - Earthwork for Utilities

B. Section 02750 – Protection, Relocation, and Restoration of Existing Utilities

C. Section 03300 - Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. American Water Works Association (AWWA).

C. American National Standards Institute (ANSI).

1.03 QUALITY ASSURANCE

Each pipe shall be clearly marked as required by governing ASTM standard specifications to show its class, date of manufacture, and name or trademark of manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

A. DEVELOPER/CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into the WORK.

B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.

1. Pipe shall not be unloaded by rolling or dropping off trucks.

2. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

C. Unload material at site of work, near place where it will be placed in trench.

1. Materials shall be placed for least interference with traffic.

2. Provide signs, lights, and barricades as necessary to protect public.

D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.

1. Keep interior of pipe, fittings and valves, free of dirt or foreign matter at all times.

2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.01 GENERAL

All sanitary sewer force mains shall be ductile iron or PVC as allowed in this section. Minimum force main size allowed shall be 4-inches in diameter. Ductile iron shall be utilized under all roads, pavement, culverts, creeks, and at any location required at the City's discretion. Depending on laying conditions and/or the City's future plans in the area, DIP may be required on any project at the City's discretion.

2.02 DUCTILE IRON PIPE

A. Shall conform to latest requirements of AWWA C151.

B. Shall be cement mortar lined in accordance with AWWA C104 standard thickness.

1. Unless otherwise specified, pipe shall have push-on compression type joints conforming to AWWA C111 or AWWA C153 (Latest Editions).

2. Minimum pressure class shall be 350 psi.

C. Ductile iron pipe for minor creek crossings shall be connected with restrained joints.

D. Ball-Joint Pipe (DIP) - Major Creek and River Crossings

1. Shall be manufactured for river crossing applications.

2. Joints shall be boltless.

3. Joints shall be restrained.

4. Joint shall provide up to 15° deflection, and rated for 350 psi.

E. Restrained Joint Pipe (DIP) - Horizontal Directional Drilling (HDD)

1. To be utilized for difficult area to open cut and Major Creek and River Crossings

2. Shall be manufactured for HDD applications.

3. Joints shall be interlocking and boltless.

4. Joints shall be restrained.

5. Joint shall provide up to 5° deflection, and rated for 350 psi.

6. Shall be "Flex-Ring" by ACIPCO or "TR-Flex" by U. S. Pipe, or approved equal.

F. Restrained Joints, Push On Type – DIP

1. Restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket” by U. S. Pipe.

2. Joint preparation and installation shall be in accordance with manufacturer’s recommendations.

G. Retainer Glands for Restraint - DIP

1. Retainer gland restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, or approved equal.

2.04 POLYVINYL CHLORIDE PIPE (PVC)

A. 4" Diameter and Larger

1. Polyvinyl chloride (PVC) pipe 4" diameter and larger shall meet requirements of AWWA C-900 (latest edition).

2. Pipe shall be a minimum Pressure Class 235 (DR 18) with outside diameter (OD) dimensions of cast iron pipe.

3. Joints

a) Shall be made with elastomeric gaskets.

b) Bell end pipe using elastomeric gaskets shall meet requirements of ASTM D2122.

c) Elastomeric gasket couplings shall meet requirements of AWWA C-900 (latest revision) for the specified pipe class and shall meet the requirements of ASTM F-477.

4. Marking

a) Provide marking as specified in AWWA C-900.

2.05 CAST AND DUCTILE IRON FITTINGS

A. Fittings for ductile iron pipe shall be cast or ductile iron and shall conform to requirements of AWWA C110 or AWWA C153 and shall be cement mortar lined in accordance with AWWA C104 standard thickness.

B. Joints shall conform to AWWA C111.

C. Fittings shall be mechanical joint unless otherwise specified on Drawings.

2.06 PLUG VALVES

A. All plug valves shall be of the tight closing, resilient faced plug type and shall be of the bi-directional eccentric seating so that the opening movement of the plug results in the plug rising off the body seat contact. Valves shall be bubble tight at 175 psi and shall be as manufactured by Pratt, DeZurik, or equivalent.

B. Valve bodies shall be constructed of cast iron ASTM A-126 Class B, and shall have integrally cast mechanical joint ends or flanged ends. End connections shall meet the following specifications: 125# ANSI B16.1 flange drilling, mechanical joint per AWWA C-111. Mechanical joint connections shall be used unless otherwise specified in the drawings.

C. Thrust bearing shall be provided at the top and bottom faced surfaces of the plug. Thrust bearings shall be stainless steel.

D. Handwheel actuators shall be provided for valves larger than six (6) inches in diameter.

2.07 AIR RELEASE VALVES

A. Air Release valves for sewage applications shall be Golden Anderson Industries, Fig. 925 Standard Sewage Air Release Valve, or equivalent.

B. The valve shall be supplied with flushing attachments consisting of: bronze shut off and flushing valves, quick-connect couplings, and 5 feet of rubber hose, for backwashing with clean water.

C. The valve shall be float operated and shall employ a compound lever mechanism to enable the valve to automatically release air and gases from a sewage pipeline while the system is pressurized and operating.

D. The valve shall close drip-tight, incorporating an adjustable Buna-N orifice button. All internal metal parts shall be stainless steel. The linkage/lever mechanism shall have the capability of being removed from the valve without disassembly of the mechanism. The float shall be stainless steel and capable of withstanding a 1,000 psi test pressure.

E. Body and cover shall be of cast iron conforming to ASTM A126 Class B. Inlet connection shall be 2" or 3" NPT, or 4" flanged as required. Outlet connection shall be 1/2" NPT.

2.08 AIR/VACUUM VALVES

A. Air/Vacuum valve shall be Golden Anderson Industries, Fig. 935 Sewage Service Air/Vacuum Valve, or equivalent.

B. The valve shall be supplied with flushing attachments consisting of: bronze shut off and flushing valves, quick-connect couplings, and 5 feet of rubber hose, for backwashing with clean water.

C. The valve shall automatically exhaust large quantities of air and gasses while the pipeline or

system is being filled and allow air to reenter during draining or when negative pressure exists.

D. The valve shall be float operated and shall close drip tight against a renewable rubber seat. All internal metal parts shall be made of stainless steel.

E. Body and cover shall be of cast iron conforming to ASTM A126 Class B. Inlet shall be NPT to 3" size, or 125# flange in 4" and larger as required. Outlet shall be NPT.

2.09 DETECTION TAPE AND WIRE

A. Detector marking tape shall be non-metallic and shall be installed minimum 2 feet above the pipe. Tape shall be highly visible and minimum 2 inches wide. Lettering shall read "Caution: Buried Sewer Line".

B. Detection wire shall be size #12 AWG, installed the entire length of the piping. Wire shall be installed minimum 2 feet above the pipe and properly connected to fittings and valves so line can be relocated with a pipe finder after burial.

PART 3 EXECUTION

3.01 PIPE LAYING

A. Excavation and bedding shall be as specified in Section 02225 (Earthwork for Utilities).

B. Each piece of pipe and each fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in trench. Pipe laying shall begin at the discharge end and proceed toward the Pump Station with the bell ends pointing upstream.

C. Bell holes shall be sufficient size to allow ample room for making pipe joints properly. Bell holes shall not be cut out more than ten joints ahead of pipe laying. The bottom of trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length as shown on the Development Drawings. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe to avoid sudden offsets or inequalities in flow line.

D. Water shall not be allowed to run or stand in trench while pipe laying is in progress, before the joints are completely set, or before trench has been backfilled.

E. No joints shall be made where pipe or joint materials have been soiled by earth in handling until such soiled surfaces are thoroughly cleaned by wire brushing and wiping until all traces of earth are removed.

F. Interior of all pipe shall be kept thoroughly clean. After each line of pipe has been laid, it shall be carefully inspected and all dirt, trash, rags and other foreign matter removed from interior.

G. Backfilling of trenches shall be started immediately after the pipe has been installed. Backfill shall be deposited and compacted as provided under the Section 02225 (Earthwork for

Utilities).

H. Force mains shall be installed so that a minimum grade of 1.0% is always maintained downhill away from a sewage air release valve. If this grade is maintained, entrapped air will always accumulate at the air release valve, and air locking of the force main will be avoided.

I. Thrust blocking shall be made of Class "C" (3000 psi) concrete as defined in Section 03300 (Concrete).

J. Full length of each section of pipe shall rest solidly upon the bedding.

1. Any pipe that has its alignment, grade or joints disturbed after laying shall be taken up and relaid.

2. Minimum cover shall be 48 inches. WORK within the Department of Transportation or railroad right-of-ways may have to be deeper than 48 inches according to their minimum requirements.

K. Contractor shall verify that no sewer is being installed in the same trench as a water main or within 10 lateral feet or 18 vertical inches of an existing waterline. Where crossings do occur, the sewer pipe is to be located so that both joints are as far from the water main as possible. If it is impossible to obtain proper horizontal and vertical separation, both the water and sewer shall be constructed complying with requirements for water supply piping and shall be pressure tested to 150 psi to assure water tighness before backfilling. The sewer should also be encased in watertight carrier pipe or concrete, extending 10 feet on both sides of the crossing. See the latest edition of the Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of State Public Health and Engineering Managers, Section 38.3.

3.02 SETTING VALVES AND FITTINGS

A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for cleaning, laying and joining pipe.

B. Valves shall be set plumb and a valve box shall be provided for every buried valve. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.

C. Backfill around valve shall be carefully tamped in 6-inch layers for full depth of trench with valve box in place.

D. Provide concrete pad at surface.

3.03 JOINT CONSTRUCTION

All joints for the various types of pipes shall be installed according to pertinent AWWA, ASTM, and manufacturer's specifications. Any defective work will be removed and replaced if it can not be corrected in accordance with the above mentioned specifications.

3.04 STREAM and UTILITY CROSSINGS

A. Pipe shall be placed beneath streambeds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.

1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.

2. Provide minimum of 48 inches under streambeds or ditches, unless approved by Engineer in writing.

3. Provide minimum of 6 inch earth or sand cushion between proposed water line and any other utility or structure or as indicated on drawings.

A. Where force mains are installed below free flowing streams, the DEVELOPER is responsible for adequate pipeline design of each crossing on a case by case basis subject to the CITY's review. The Developer's Engineer shall consider the soils, creek flow, pressure, topography, thrust restraint, construction techniques allowed, etc. in order to design and specify appropriate layout and pipe joints.

B. The DEVELEPER shall be responsible for all and any necessary permitting by the all authorities having jurisdiction for stream crossings or crossing of state waters including but not limited to EPD, County, and the Army Corps of Engineers.

3.05 HYDROSTATIC TESTS

A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600 and or C605.

B. General Procedure

1. Furnish and install corporation stops at high points on line to release air as line is filled with water.

2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.

3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not less than 150 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.

a) Test pressures shall be as directed by the CITY.

b) Test shall be conducted for a minimum of 2 hours.

b) Pressure shall not vary by more that 5 psi during test.

4. Testing Allowance.

a) The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain ±5 psi of the test pressure.

b) The maximum allowable makeup water shall be based on the following formula:

$$L = \frac{S \times D \times (P^{0.5})}{148{,}000}$$

Where L is the testing allowance of makeup water in gallons per hour; S is the test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.

c) No pipe installation shall be accepted if the amount of make up water required exceeds the amount determined in the formula above.

5. Locate, remove, and replace any defective pipe, valves, fittings, or hydrants.

6. Repeat tests until results are satisfactory to the CITY.

END OF SECTION

SECTION 02736

SANITARY SEWER

PART 1 GENERAL

1.01 RELATED WORK

Section 02225 - Earthwork for Utilities

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. American Water Works Association (AWWA).

C. American National Standards Institute (ANSI).

1.03 QUALITY ASSURANCE

A. Each pipe shall be clearly marked as required by governing ASTM standard specifications to show its class, date of manufacture, and name or trademark of manufacturer.

B. Any pipe or specials that have been broken, cracked, or otherwise damaged before or after delivery, or which have failed to meet required tests, shall be removed from site of work and shall not be used.

C. If the PVC sewer pipe diameter, thickness, or lengths in any way appear to be defective, dimensions shall be verified in accordance with ASTM D 2122, Standard Test Methods for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.04 DELIVERY, STORAGE AND HANDLING

A. DEVELOPER/CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into the WORK.

B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.

1. Pipe shall not be unloaded by rolling or dropping off trucks.

2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground. Unload material at site of work, near place where it will be placed in trench.

C. Unload material at site of work, near place where it will be placed in trench.

1. Materials shall be placed for least interference with traffic.

2. Provide signs, lights, and barricades as necessary to protect public.

D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.

1. Keep interior of pipe, fittings and valves, free of dirt or foreign matter at all times.

2. Do not place materials in drainage ways or ditches.

PART 2 PRODUCTS

2.01 GENERAL

A. Pipe and fittings shall be new materials which have not been previously used.

B. Minimum depth for sanitary sewer shall be four (4) feet except under pavement; then, the minimum depth shall be seven (7) feet.

C. Where sanitary sewer needs to be installed with less than seven (7) feet of depth under paved roads, ductile iron pipe must be used in accordance with this specification.

D. Sanitary sewer greater than fifteen (15) feet deep shall be ductile iron in accordance with this specification.

E. Transitions from PVC pipe to ductile iron pipe are allowed between manholes only in the direction of flow. When installing ductile iron pipe, no transitions to PVC are allowed in the downstream flow direction. Ductile iron pipe must be installed to the next manhole downstream.

F. Bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.

2.02 BEDDING AND BACKFILL

A. Bedding material shall be as specified in Section 02225 (Earthwork for Utilities).

B. Backfill material shall be as specified in Section 02225 (Earthwork for Utilities).

2.03 DUCTILE IRON PIPE (DIP)

A. Ductile iron pipe supplied may be push-on, mechanical, or flanged joint.

B. Ductile iron pipe shall:

1. Conform to AWWA C150 and AWWA C151.

2. Be thickness pressure class 350.

3. Be cement lined in accordance with AWWA C104.

4. Have rubber jointed gaskets conforming to AWWA C111.

C. The weight, casting period, and class or nominal thickness shall be shown on each pipe. The manufacturer's mark, the year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be clear and legible. All cast marks shall be on, or near, the bell.

2.04 POLYVINYL CHLORIDE PIPE (PVC)

A. Pipe shall meet all requirements of ASTM D-3034, SDR-35, unless otherwise specified. Pipe shall be unplasticized polyvinyl chloride with integral wall bell and spigot joints with a rubber ring gasket.

B. Fittings shall meet all requirements of ASTM D-3034, SDR-35, unless otherwise specified. PVC material shall have a cell classification of 12454-B or C as defined in ASTM D-1784. Fittings in sizes through 8" shall be molded in one piece. Fittings 10" and larger shall be molded or fabricated. Gaskets shall have a minimum cross-sectional area of 0.20 sq. in. and conform to ASTM F-477.

C. Provisions must be made for contraction and expansion at each joint with an elastomeric gasketed joint.

D. Joints shall utilize rubber gaskets conforming to ASTM F477.

2.05 CLEANOUTS

A. Pipe cleanouts shall be the same size as the pipe. A cleanout installation shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. A countersunk PVC screw plug shall be caulked in female adapter.

B. An 18" diameter or square by 4" thick concrete cleanout collar shall be provided for each cleanout.

2.06 FLEXIBLE COUPLINGS

A. Flexible Coupling shall be made of polyvinyl chloride with stainless steel sheer ring, manufactured by FERNCO, or approved equivalent.

B. Sizes of flexible couplings shall be selected according to the types of pipe material being used.

2.07 PVC BACKWATER VALVE

A. Backwater valve shall be made of Type 1 PVC according to ASTM D1784, cell classification 12454.

B. Valve seats shall be EPDM.

C. Shall meet requiremnts of ASME/ANSI A112.14.1 for backwater valves.

D. Manufacture shall be Spears or approved equal.

PART 3 EXECUTION

3.01 PIPE LAYING

A. Manholes shall be installed at a maximum distance of 400 feet.

B Contractor shall verify that no sewer is being installed within 10 lateral feet or 18 vertical inches of an existing waterline. Where crossings do occur, the sewer pipe is to be located so that both joints are as far from the water main as possible, and sliplined or encased in concrete. See the latest edition of the Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of State Public Health and Engineering Managers, Section 38.3 and City Standard Details.

C. Excavation and pipe bedding shall be performed in accordance with Section 02225 (Earthwork for Utilities).

D. Each piece of pipe and each fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in trench. Pipe laying shall proceed upgrade, starting at lower end of grade and with the bells uphill.

E. Bell holes shall be sufficient size to allow ample room for making pipe joints properly. Bell holes shall not be cut out more than ten joints ahead of pipe laying. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe in order to avoid sudden offsets or inequalities in flow line.

F. Water shall not be allowed to run or stand in trench while pipe laying is in progress, before the joints are completely set, or before trench has been backfilled.

G. No joints shall be made where pipe or joint materials have been soiled by earth in handling until such soiled surfaces are thoroughly cleaned by wire brushing and wiping until all traces of earth are removed.

H. As work progresses, interior of all pipe shall be kept thoroughly clean. After each line of pipe has been laid, all earth, trash, rags and other foreign matter shall be removed from interior.

I. Backfilling of trenches shall start immediately after the pipe has been installed. Backfill shall be deposited and compacted as provided under Section 02225 (Earthwork for Utilities).

J. Full length of each section of pipe shall rest solidly upon the bedding. Any pipe that has its alignment, grade or joints disturbed after laying shall be taken up and relaid.

K. Piping shall have a minimum slope as per the Ten States Standards.

Nominal Sewer Size	Minimum Slope in ft/100ft (m/100m)
8 inch (200mm)	0.40
10 inch (250mm)	0.28
12 inch (300mm)	0.22
14 inch (350mm)	0.17
15 inch (375mm)	0.15
16 inch (400mm)	0.14
18 inch (450mm)	0.12
21 inch (525mm)	0.10
24 inch (600mm)	0.08
27 inch (675mm)	0.067
30 inch (750mm)	0.058
33 inch (825mm)	0.052
36 inch (900mm)	0.046
39 inch (975mm)	0.041
42 inch (1050 mm)	0.037

Maximum slopes and velocities shall be in accordance with the Ten States Standards as follows:

Where design velocities exceed 15 feet per second, special provisions incorporated to protect against displacement by erosion and impact.

Sewers on 20 percent slopes or greater shall be anchored securely with concrete, or equal, anchors spaced as follows:

a. Not over 36 feet center to center on grades 20 percent and up to 35 percent

b. Not over 24 feet center to center on grades 35 percent and up to 50 percent

c. Not over 16 feet center to center on grades 50 percent and higher.

3.02 DETECTION TAPE

A. Detector marking tape shall be installed minimum 2 feet above the pipe. Tape shall be high visibility green and minimum 2 inches wide. Lettering shall read "Caution: Buried Sewer Line".

3.03 REPAIR CONNECTIONS

A. When repair connections are to be made, the City has the ultimate discretion to approve or disapprove of the proposed repair method by the CONTRACTOR. Existing pipe wastewater flow is to be stopped. If necessary, temporary measures are to be taken to ensure continuous sewer service. Bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.

B. Saw cut the existing pipe five feet (5') minimum each side of the break.

C. Prepare pipe bedding in accordance with the Standard Bedding Details.

D. Replace the pipe with a section of pipe that is the same diameter and length as that removed.

E. Insert the flexible couplings and tighten in accordance with the manufacturers specifications.

F. Insert the stainless steel sheer ring in accordance with the manufacturer's specifications.

G. Prior to backfilling the open trench, allow flow to return to the pipe and check for leaks.

H. Backfill the trench in accordance with Section 02225 - Earthwork for Utilities.

I. Videotape and perform pressure tests in accordance with this Section, Part 3.

3.04 SERVICE CONNECTIONS

A. Service connections to the main sewer shall be provided as per the Standard Details. Each service line is to have a cleanout and PVC backwater check valve at the property line and cleanouts located along the service line between the property line and the building. The spacing of the cleanouts shall not exceed 80 feet. Cleanouts will also be provided at all 90 degree and 45 degree horizontal bends. Services lines will be run at a minimum grade of 1%. If there is more than one discharge point from the building to be served, (i.e. bathroom discharge separate from laundry discharge) then they shall be combined to enter the trunk sewer as one.

B. If the existing structure does not have toilet facilities, then the service piping shall be run to within two feet (2') of the lowest point on the perimeter of the structure and marked as described above.

D. Saddle taps are not to be used on new sewer mains. Tee-wyes of the appropriate size are to be used.

E. Where connection to an existing sewer is necessary, it shall be performed with a saddle tap core. "Knock-outs" will NOT be allowed. All cores are to be performed in the presence of a representative of the CITY.

F. Septic Tank Demolition

1. When sewer service connections are made to the City of Baldwin sewer system from an existing private septic tank, the existing septic tank is to be abandoned at the owner's expense.

2. A licensed septic tank pumper shall remove all water and sludge from the tank and dispose of the waste at an approved location. Septic tank contents shall not be disposed of in the new or existing sewer system or treatment facility.

3. After the tank is empty, a hole is to be broken through the bottom of the tank to allow drainage. A minimum of 3 inches of lime is to be placed in the tank bottom and then the top is to be broken and dropped in the tank. The tank shall be completely filled with sand clay material (compacted in 8 inch lifts), and the disturbed area shall be covered with topsoil and restored to the pre-existing condition.

3.05 JOINT CONSTRUCTION

All joints for the various types of pipes shall be installed in accordance with pertinent AWWA, ASTM, and manufacturer's specifications. Any defective work will be removed and replaced if it cannot be corrected in accordance with the above mentioned specifications.

3.06 INSPECTION

The pipe inspector shall be notified no later than 48 hours (Monday through Friday) before installed pipe is scheduled to be buried, tested, or inspected.

Prior to scheduling any testing of the sewer infrastructure, all final grading and stabilization including cuts and fills must be complete in the vicinity of the sewer piping. No official testing of manholes and piping (air test, mandrel, video, vacuum test, etc.) shall begin until final grade, sub-base, and curb has been completely installed on site. Once final grade has been established, the DEVELOPER may request and schedule inspection and testing with the CITY. Testing shall not commence until the CITY is satisfied that the above criteria and the intentions of said criteria have been met.

A. After completion of any section of pipe, the grades, joints and alignment shall be true to line and grade.

1. Joint surfaces shall be smooth.

2. There shall be no visible leakage and sewer shall be completely free from any cracks, protruding joint materials, deposits of sand, mortar or other materials on inside.

B. Low Pressure Air Leakage Testing

Immediately following cleaning, the installed sewer shall be tested using low pressure air. This testing shall be conducted in accordance with ASTM Section F-1417-92, “Time-Pressure Drop Method”. General procedures are as follows:

1. Isolate the section of sewer line to be tested by inflatable stoppers or other suitable test plugs.

2. Plug or cap the ends of all branches, laterals, tees, wyes, and stubs to be included in the test to prevent air leakage. All plugs and caps shall be securely braced to prevent blow-out. One of the plugs or caps should have an inlet tap, or other provision for connecting a hose to a portable air control source.

3. Connect the air hose to the inlet tap and portable air control source. The air equipment shall consist of necessary valves and pressure gages to control an oil-free air source and the rate at which air flows into the test section to enable monitoring of the air pressure within the test section.

4. Add air slowly to the test section until the pressure inside the pipe reaches 4.0 psig.

5. After the pressure of 4.0 psig is obtained, regulate the air supply so that the pressure is maintained between 3.5 to 4.0 psig for at least 2 minutes depending on air/ground temperature conditions. The air temperature should stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until equilibrium is obtained; however, a minimum of 3.5 psig is required.

6. All test pressures are measured as gage pressure, which is any pressure greater than atmospheric pressure. Since water produces a pressure of 0.43 psi for every foot of depth, air test pressures must be increased to offset the depth of ground water over the sewer line. If the ground water level is 2-feet or more above the top of the pipe at the upstream end, or if the air pressure required for the test is greater than 9-psi gage, the air test method should no be used. Before the air test method is used, the ground water level should be lowered by pumping or dewatering.

7. *Time-Pressure Drop Method*—Air is slowly introduced into the section of pipe to be tested, until the air pressure is raised to approximately 4.0 psi and the test pipe section is stabilized. Disconnect the air supply and decrease the pressure to 3.5 psi before starting the test. Determine the time required for the pressure to drop from 3.5 psi to 2.5 psi, and compare this interval to the required time to decide if the rate of air loss is within the allowable. Minimum holding times required by pipe diameter are shown in Table 1.

Table 1

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

8. If pipe installation fails to meet these requirements, CONTRACTOR shall determine source or sources of leakage, and shall repair or replace all defective materials or workmanship.

9. Final acceptance of each section or run of sewer tested will not be issued until leakage has been reduced to rates not exceeding maximum specified herein.

C. Mandrel Testing

A mandrel test of the sewer shall be made at least 30 days after backfilling as follows:

1. Developer is to utilize an approved mandrel kit to test all reaches of the sewer.

2. Mandrel shall be pulled through all gravity sewer pipe while CITY's representative is present.

3. Mandrel shall be sized to allow 5% maximum deflection in pipe dimension. Mandrel diameter at 5% deflection shall be calculated as per ASTM D 3034, Appendix X1, or ASTM F 679, Appendix X2.

4. The mandrel deflection test shall be done no sooner than thirty (30) days after final backfill has been placed. The mandrel shall be hand pulled through all sections of the sewer lines. If the mandrel can be hand pulled through the entire length of the section tested, the section shall have passed the test. If the mandrel cannot be hand pulled through the entire length of the section tested, the section shall have failed the test. The Contractor shall be required to uncover, replace, or repair any section of sewer not passing the mandrel test.

D. Videotaped Record

1. DEVELOPER/CONTRACTOR is to provide the CITY with a color DVD of the inside of every reach of sanitary sewer installed.

2. Tape shall record the following information:

   a. Manhole number to manhole number
   b. Date of recording
   c. Distance record from start of run
   d. Distance and location description of every service line connection installed.

3. Tape shall be labeled with date of recording and location.

4. The manhole numbering system shall be the same as shown on the approved Development Drawings.

E. Miscellaneous Items

1. Safety Precautions: Low pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, a line is over pressurized or plugs are installed improperly. It is extremely important that various plugs be installed so as to prevent sudden expulsion of a poorly installed or partially inflated plug (i.e., a force of 250 lbs. (112N) is exerted on an 8-inch (200 mm) plug by an internal pressure of 5 psi (34 kPa)). Observe the following precautions:

   a) No one shall be allowed in manholes during testing because of hazards.
   b) Install all plugs securely.
   c) When lines are to be tested, it may be necessary that plugs be braced as an added safety factor.

2. Special Equipment

   a) Air compressor with capacity of 85 cubic feet to 125 cubic feet.
   b) Pressure bags (plugs) for each size of pipe installed.
   c) Bracing material for plugs may be required during testing as an added safety factor.

3.07 FINAL ACCEPTANCE

A. Final inspection will include a visual observation of each section of sewer by looking from manhole to manhole with aid of reflected sunlight or an electric torch in the presence of the CITY's REPRESENTATIVE.

B. Such light used for inspection shall be plainly visible from manhole to manhole. Reflected light from manhole to manhole will not be considered as plainly visible light and shall be reason for rejection of section of sewer as not being laid true to line and grade.

C. Pipe shall be true to line and grade; shall show no leaks; shall be free from cracks and dirt or other materials which will reduce full cross sectional area.

D. Joints shall be tight.

E. Finished acceptance of each section or run of sewer tested will not be issued until leakage has been reduced to rates not exceeding maximum specified herein as permissible.

END OF SECTION

SECTION 02750

PROTECTION, RELOCATION AND RESTORATION OF EXISTING UTILITIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. DEVELOPER/CONTRACTOR is responsible for determining the location of all existing utilities in the work area. **The Utilities Protection Center (UPC) must be contacted at least three regular business days before work begins. The UPC can be reached at the statewide toll-free number: 811.**

B. DEVELOPER/CONTRACTOR shall be required, at his own expense, to do everything necessary to protect, support, and sustain all sewers, culverts, water, or gas pipes, electric lights, power, telephone, or telegraph poles or conduits, and other fixtures laid across or along site of WORK, even to the extent of using hand labor in making trench openings under or over these. OWNER, as well as company or corporation owning said pipes, poles, or conduits must be notified in advance of same by DEVELOPER/ CONTRACTOR, before any such fixtures are removed or disturbed. In case any sewer, gas, or water pipes, service pipes, electric lights, power, telephone or telegraph poles or conduits, or other fixtures are damaged they shall be repaired by authorities having control of the same, and expense of repairs shall be paid by the DEVELOPER/ CONTRACTOR.

C. No underground or overhead facilities encountered shall be disturbed without proper authority from OWNER, and then only in such manner as OWNER may prescribe and approve.

D. Should it become necessary to change position, or permanently or temporarily remove any electric conduits, telephone conduits, water pipes, gas pipes, sewerage pipes, or other pipes, conduits, or wires in order to clear structure being built or to permit DEVELOPER/CONTRACTOR to use a particular method of construction DEVELOPER/CONTRACTOR shall cease work if necessary, until satisfactory arrangements shall have been made by owners of said pipes, wires, or conduit, to properly care for or relocate same as necessary to permit WORK to proceed as required for proper completion of Contract.

1.02 GENERAL CONDITIONS

A. DEVELOPER/CONTRACTOR shall locate all underground obstructions prior to excavation so as to prevent any damage to those services or other utilities.

B. Any damages must be repaired without delay and cost of such repairs must be borne by DEVELOPER/CONTRACTOR.

PART 2 PRODUCTS

A. See Section 02660 - Water Distribution Systems

B. See Section 02732 - Sanitary Sewer Force Mains

C. See Section 02736 - Sanitary Sewer

D. See Section 03300 - Concrete

PART 3 EXECUTION

3.01 RELOCATION OF WATER LINES

A. Only when approved by the CITY shall any water mains, service lines, or water meters be relocated during progress of WORK.

B. Material used for relocation of any water mains or appurtenances shall be of same size and strength as existing material.

C. When existing water lines and appurtenances are removed for relocation and are not to be replaced by new material, they shall be suitably stored until they are relocated.

D. When existing water lines and appurtenances are removed for relocation and are to be replaced by new material, remaining materials shall be disposed of by DEVELOPER/CONTRACTOR at his expense.

3.02 RELOCATION OF SANITARY SEWERS

A. Only when approved by the CITY shall any sanitary sewer lines or service laterals be relocated during progress of WORK.

B. Material used for relocation of any sanitary lines shall be of same size and strength as existing material. As a minimum, materials shall be as specified herein.

C. Removed material during relocation of sanitary sewers shall be disposed of by DEVELOPER/CONTRACTOR at his expense.

D. Allowing raw wastewater to flow onto the ground or into a receiving stream is strictly prohibited.

3.03 RELOCATION OF ELECTRIC POWER POLES AND CONDUITS

A. Power pole relocation and electric service relocation shall be performed by Local Electrical Department.

B. Temporary electrical service shall be provided when permanent electric service will be interrupted for more than one day.

C. Cost of relocation of all electric utilities shall be responsibility of DEVELOPER/ CONTRACTOR.

3.04 RELOCATION OF GAS LINES

A. Gas mains and gas services are to be relocated by the local gas company.

B. Temporary gas service shall be provided when permanent gas service will be interrupted for more than one day.

C. Cost of relocation for gas mains shall be responsibility of DEVELOPER/ CONTRACTOR.

3.05 RELOCATION OF TELEPHONE

A. Telephone cable and conduit are to be relocated by the local telephone company.

B. Cost of relocation of the telephone cable and conduit shall be the responsibility of DEVELOPER/CONTRACTOR.

END OF SECTION

SECTION 02905

SITE RESTORATION

PART 1 GENERAL

1.01 SCOPE OF WORK

Work included in this section consists of, but is not limited to: the restoration of pavement (asphalt, concrete and granular), driveway, concrete curbs and gutters, sidewalks, fences, walls, underground and above ground utilities, repair, replacement and/or relocation. Restoration of the landscaping, i.e., shrubs, trees and grassing, is also part of this work.

1.02 REFERENCES

A. Baldwin Standard Details

1.03 QUALITY ASSURANCE

A. The DEVELOPER/CONTRACTOR shall notify the Utility Protection Center at least 72 hours prior to beginning any construction. Call TOLL FREE 811, 7:00 A.M. to 4:30 P.M., Monday through Friday.

B. Any existing site improvements damaged during construction will be repaired at the DEVELOPER/CONTRACTOR's expense, to its existing condition to the satisfaction of OWNER and CITY OF BALDWIN.

PART 2 PRODUCTS

2.01 MATERIALS

A. Existing materials may be reused when restoring the construction site to original condition unless those materials have been damaged or deteriorated in any way.

If material cannot be reused as determined by the CITY, it shall be replaced with new material of like type at DEVELOPER/CONTRACTOR's expense.

PART 3 EXECUTION

3.01 GENERAL

Particular care shall be taken to minimize disturbance to existing site improvements within the limits of construction. The DEVELOPER/CONTRACTOR will take whatever measures are necessary to prevent damage, which may include, but is not limited to, erection of barriers, tree protective fencing, shoring and bracing of excavations and staging of the construction.

3.02 CONSTRUCTION

A. No excavations shall be allowed to remain open overnight. Excavations shall be properly backfilled or covered with steel plates to allow safe crossing of trenches by vehicles and/or pedestrians.

B. All work must be approved by the owner and the City of Baldwin prior to acceptance.

3.03 MAINTENANCE

A. The DEVELOPER/CONTRACTOR will notify the CITY to inspect restored areas as soon as construction is complete and no further disturbances/damages would be likely to occur.

B. For work performed on Georgia D.O.T., Local County, and the CITY OF BALDWIN property or Rights-of-Way, the DEVELOPER/CONTRACTOR shall warrant the work free from defects of material and workmanship for a period of one year after acceptance.

C. Clean up work areas by removing any scraps, rubbish or surplus material and dispose of properly off the project site.

D. Wash and hose down paved surfaces to remove all mud, debris, and other extraneous material prior to final inspection.

END OF SECTION

SECTION 02931

GRASSING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Work under this section includes preparation of subsoil, placement of topsoil and seeding or sodding of all areas disturbed during construction activities as defined on the drawings.

B. This section also includes maintenance of all grassed areas. Maintenance consists of regular mowing, fertilizing, and regular watering until acceptance by the CITY.

1.02 RELATED WORK

Section 02270 – Temporary Erosion Control

1.03 REFERENCES

A. "Manual for Erosion and Sediment Control in Georgia" - latest edition, prepared by the Georgia Soil and Water Conservation Commission.

B. ASPA (American Sod Producers Association) - GuideLine Specifications to Sodding.

C. Standard Specifications, Construction of Roads and Bridges, (latest edition), State of Georgia, Department of Transportation.

1.04 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Deliver sod on pallets. Protect exposed roots from dehydration.

D. Do not deliver more sod than can be laid within 36 hours.

1.06 MAINTENANCE SERVICE PERIOD

A. Maintain grassed areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two (2) cuttings.

PART 2 PRODUCTS

2.01 Seeding or sodding materials shall be in accordance with approved species requirements in the "Manual for Erosion and Sediment Control in Georgia" - latest edition.

PART 3 EXECUTION

3.01 EXAMINATION

Verify that prepared soil base is ready to receive the work of this Section.

3.02 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be seeded or 2 inches over area to be sodded. Rake until smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

3.03 SEEDING AND SODDING OPERATIONS

A. Seeding and Sodding operations shall be in accordance with approved species, schedules, application rates, and planting procedures required in the "Manual for Erosion and Sediment Control in Georgia" – latest edition.

PART 4 ACCEPTANCE

4.01 GENERAL REQUIREMENTS

A. The CONTRACTOR/DEVELOPER shall provide plant establishment of the specified permanent vegetation prior to final acceptance of the Project. Plant establishment shall consist of preserving, protecting, watering, reseeding, or replanting and other such work and at such time as may be necessary to keep the grassed areas in a satisfactory condition. The CONTRACTOR/DEVELOPER shall water the grassed areas during such period as frequently as necessary to promote maximum practicable growth. Water shall be provided by the Contractor at his expense.

B. The CITY may require replanting at any time if an area or a portion of such area shows unsatisfactory growth.

4.02 GROWTH AND COVERAGE

A. It shall be the Contractor's responsibility to ensure satisfactory growth and coverage. Grassed areas will be considered acceptable when grass has reached a point of maturity, coverage is at least 98% of the total area with no bare spots exceeding one square foot, and the ground surface is fully stabilized against erosion.

B. Maintain newly graded, topsoiled, and seeded areas until final acceptance. Restore areas showing settlement or washes to specified grades at CONTRACTOR/DEVELOPER's expense. Newly seeded areas shall be watered as necessary or reseeded at the CONTRACTOR/DEVELOPER's expense until final acceptance.

END OF SECTION

SECTION 03300

CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

Concrete foundation walls, sanitary structures, pipe encasements, thrust blocking and slabs on grade.

1.02 REFERENCES

A. ACI 301 – Specification for Structural Concrete

B. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

C. ACI 350R – Environmental Engineering Concrete Structure

D. ASTM C33 – Specification for Concrete Aggregates

E. ASTM C94 - Specification for Ready-Mixed Concrete

F. ASTM C150 - Specification for Portland Cement

G. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete

H. ASTM C494 - Specification for Chemical Admixtures for Concrete

I. Georgia Department of Transportation Standard Specifications (Section 500)

J. ACI 306.1 – Standard Specification for Cold Weather Concreting

1.03 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301 and 318.

B. Obtain materials from same source throughout the WORK.

C. Tests: As listed in "Methods of Sampling and Testing", Section 18, ASTM C94. Qualifications of laboratory, responsibilities of all parties involved, and designation of the party to employ, and to pay for, specified services are covered in the Supplementary General Provisions.

1. Concrete:

a) Mix and Control: The verifications and control of concrete mixes shall be the work of an independent testing laboratory. Cost of testing shall be paid by DEVELOPER/CONTRACTOR.

b) Laboratory Services shall be as follows:

Test aggregates for specifications compliance.

2. Contractor shall submit design mixes and testing as required by ACI 301.

1.04 TESTS

A. Testing and analysis of concrete will be performed in accordance to ACI 301.

B. Submit proposed mix design of each class of concrete to ENGINEER for review prior to commencement of work.

C. Four concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed each day.

D. One slump and entrained air test will be taken for each set of test cylinders taken.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I, II, or III Portland Type.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.02 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical Admixture: ASTM C494, of any type must be approved prior to use.

2.03 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete for all applications of the following characteristics:

1. Class B - Normal Weight 4,000 psi @ 28 days

2. Class C - Normal Weight 3,000 psi @ 28 days

3. Class D - Normal Weight 2,500 psi @ 28 days

C. Use accelerating admixtures in cold weather only when approved. Use of admixtures will not relax cold weather placement requirements.

D. Use set-retarding admixtures during hot weather only when approved.

E. Concrete mix for concrete work subject to freeze-thaw cycling will have entrained air in accordance with ACI 301.

PART 3 EXECUTION

3.01 INSPECTION

Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Bonding agent shall be approved prior to use. Apply bonding agent in accordance with manufacturer's instructions.

3.03 PLACING CONCRETE

A. Notify the CITY a minimum of 24 hours prior to commencement of concreting operations.

B. Place concrete in accordance with ACI 301.

C. Hot Weather Placement: When hot weather placement is required, Contractor shall submit plans for approval by Owner and Engineer.

D. Cold Weather Placement: ACI 306.1.

E. Ensure reinforcement, inserts, embedded parts, formed joints and opening are not disturbed during concrete placement.

F. Maintain concrete cover around reinforcing as per ACI 318.

G. Place concrete continuously between predetermined construction joints. Construction joints not in construction plans shall be approved.

H. All construction joints shall be constructed in accordance with construction documents.

I. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify CONTRACTOR/DEVELOPER and CITY upon discovery.

J. Placing during non-daylight hours

1. Concrete shall be placed during daylight hours unless otherwise approved by the Engineer. Placing of concrete in a portion of work shall not be started unless that portion of the work can be completed during daylight. Daylight is defined as the period one hour before sunrise to one hour after sunset.

2. If it is desired by the CONTRACTOR to place concrete during non-daylight hours, the CONTRACTOR shall provide an adequate lighting system approved by the ENGINEER. Approval of the placing of concrete during non-daylight hours shall in no way lessen the responsibility of the CONTRACTOR as related to the WORK.

3.04 FINISHING

A. Concrete surfaces shall have rough edges tooled-off; irregularities shall be filled pointed-up and spot finished.

B. Dress all exposed concrete corners with a ¾" x ¾" chamfer.

3.05 FIELD QUALITY CONTROL

A. Concrete Control: The verification and control of all concrete shall be performed by an independent testing laboratory. Cost of testing shall be paid by CONTRACTOR/DEVELOPER. All concrete testing shall be performed by ACI certified technicians in accordance with ASTM C94.

B. Laboratory Services shall be as follows:

1. Make, cure, store and break test cylinders conforming to requirements of ASTM C31 "Standard Method of Making and Curing Concrete Test Specimens in the Field"; ASTM C39 "Standard Method of Test for Compressive Strength of Cylindrical Specimens"; ASTM C143 "Standard Method of Test for Slump of Portland Cement Concrete"; ASTM C172 Test cylinders and slump tests shall be made at job site and under no circumstances shall they be taken at a central mixing plant.

2. Reports on all tests conducted by laboratory shall be rendered promptly and distributed as follows:

a) CITY - two (2) copies

b) DEVELOPER/CONTRACTOR - As requested

2. Reports of control cylinders for job placed concrete shall conform with the requirements of ASTM C94.

C. Contractors Function in Concrete Testing

1. Contractor/Developer shall comply with ACI 301. Contractor/Developer shall provide assistance as necessary for cylinder sampling.

2. Keep a daily log, recording quantities of each class of concrete used, the area of location of each quantity of concrete relating to its controlling cylinder and the slump of this concrete, and general weather conditions. The CONTRACTOR/DEVELOPER shall furnish this information to the laboratory for inclusion in the test reports. The CONTRACTOR/DEVELOPER shall obtain delivery tickets showing the class and strength of concrete, the size of coarse aggregate and the slump order. The CONTRACTOR/DEVELOPER shall identify these tickets relative to the area of placement of the concrete and shall retain them on file. He shall produce the tickets, should CITY so request.

D. Detailed Requirements

1. Of the test cylinders taken, one shall be broken at 7 days, two shall be broken at 28 days and one held in reserve.

2. Acceptance of concrete shall be in accordance with ACI 301.

3.06 PATCHING

A. Patch imperfections.

3.07 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

3.08 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

SECTION 11310

SUBMERSIBLE SEWAGE PUMP STATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The lift station shall be designed at a minimum in accordance with standards and references set forth by the Georgia Department of Natural Resources, and in accordance with the CITY's minimum requirements as well.

B. For subdivisions, apartment complexes, shopping centers, and similar developments, the CITY requires the use of submersible-type lift stations. All wastewater lift stations shall be reviewed by the CITY and the Georgia Department of Natural Resources on a case-by-case basis.

C. For the CITY's review, the DEVELOPER-CONTRACTOR shall submit a separate report with the plans including Detail Sheet LS-1 completed with all pertinent data, and documentation showing all necessary calculations for appropriate lift station and wetwell design. The CITY may require any additional information at its discretions in order to complete its review.

D. Each lift station design and site is unique, and shall be reviewed by the CITY as such. This includes site layout, access, electrical requirements, appearance, controls, etc. These standards are presented as a minimum requirement and guideline only; changes or additional requirements to each station may be required by the CITY at their discretion as a result of review during plan submittals and/or construction.

E. The use of grinder pumps shall be only considered in extreme cases where gravity flow and conventional lift stations are not feasible. All grinder pump installations for public sewer service shall be submitted to and approved by EPD.

1.02 PUMPS

A. The CITY accepts only submersible sewage pumps: heavy duty, vertical shaft, non-clog type, submersible centrifugal pumps manufactured by FLYGT.

B. The pumps furnished under this Section shall be the product of the same supplier to ensure maximum compatibility and interchangeability of parts. The DEVELOPER-CONTRACTOR shall assign unit responsibility to the pump supplier or manufacturer for the equipment specified in this section in order to enhance compatibility, ease of construction, and efficient maintenance of the components of each pumping system. The pump manufacturer shall coordinate pump controls so that a complete and operable system is achieved.

C. Refer to Section 16000, Electrical Plans for electrical equipment requirements.

1.03 MINIMUM GENERAL REQUIREMENTS

A. All stations shall be a duplex at minimum.
B. All stations shall be designed as submersible non-clog lift station complete with access drive, maintenance friendly layout and grading, motors, permanent discharge elbows, guide bars, intermediate, upper and lower guide bar brackets, power cables, lifting chains, pump controls, level sensor, generator, lighting and pole, yard hydrant, anchor bolts, valve vault, wetwell, aluminum access hatches, security fence, site work, spare parts and other accessories including all necessary labor, supervision, materials, tools, and appurtenances.
C. Minimum wetwell diameter shall be 8-feet.
D. Each station shall be furnished and installed with a permanent standby generator in accordance with specification section 16621.
E. Each lift station shall be furnished and installed with Flygt-FMC Controller with modem dialer function, and connected to the CITY's existing telemetry system . Contact the CITY's sewer department for the latest requirements.
F. Check valves shall weighted type.
G. See lift station details for reference.
H. All phases of construction shall be inspected as per the CITY's requirements.
I. Lift Station access road shall be paved asphalt.
J. All pumps shall be capable of passing a 3-inch solid.
K. "No trespassing" signs shall be placed on all four sides of the pump station security fencing.

1.04 WORK INCLUDED

The DEVELOPER-CONTRACTOR shall furnish and install at the locations shown on the Approved Drawings, as specified or as directed, electrical submersible pump(s) required to complete the project.

The DEVELOPER-CONTRACTOR shall be responsible for any and all details and special construction required whether or not shown in the City's Standards or on the Approved Drawings or called for in these specifications. The DEVELOPER-CONTRACTOR shall be responsible for the complete installation and responsibility for the proper operation of the various components of this section. It shall also include painting, field testing and additional services of the equipment supplier.

1.05 WORKMANSHIP AND MATERIALS

All equipment and materials furnished under this Contract shall be new, suitable for the conditions of service to which they will be subject and equal to the best of their respective classes. Grade and quality shall meet the applicable cited specifications and standards.

Workmanship shall be of the highest quality and shall be carried out by competent and experienced workmen.

1.06 SUBMITTALS

Shop drawings, minimum 3 copies each, for the pumping station, associated equipment, and generator

shall be submitted to the CITY for review and comment prior to installation by the DEVELOPER-CONTRACTOR. The shop drawings must bear the stamp and approval of the design engineer prior to submitting to the CITY. The DEVELOPER-CONTRACTOR shall provide to the CITY as a minimum the submittals listed below. Submittals shall be submitted to the CITY and approved prior to fabrication, shipment or work specified under this section begins.

1. Manufacturer's data including materials of construction and equipment weight.

2. Predicted performance curves developed for the specific application. Performance curves shall plot speed, capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation.

3. Motor submittal data.

4. Shop drawings including dimensions and cross sectional views of all equipment showing details of construction.

5. Shop drawings including plan and sectional views of the pumps in the sump.

6. A written report on the factory test results as specified in Section 1.07 of this Specification.

7. Extended warranty as specified in Section 3.08 of this Specification.

The DEVELOPER-CONTRACTOR shall also include complete working details, dimension, assembly, and installation drawings, catalog and other data, and manufacturer's specifications and data indicating all parts, accessories and appliances, all piping, valves, motors, conduit, wiring and equipment, methods and material of construction, location, and installation, support, anchorage and connections and wiring diagrams, surface finishes and other information as may be required, complete in every detail, to define the articles to be furnished and indicate whether or not they comply with the Specifications.

A tabulated list of all motors and electrical devices shall also be furnished. Include ampere and voltage operating characteristics for all devices. For motors, include full load amperes, power factor, efficiencies, slop and temperature rise. Process the tabulated list, plus all special wiring diagrams as shop drawings and as soon as possible in order to expedite the electrical work on electrical drawings.

The DEVELOPER-CONTRACTOR shall also furnish under this section 3 (3) bound copies of complete and detailed instructions for the operation, lubrication, and maintenance of all equipment furnished and installed hereunder. The manuals shall be furnished after final approval of all shop and working drawings but prior to shipment of equipment. Manuals shall be complete with wiring diagrams, lubrication schedules and recommended lubricants, drawings, cuts, parts lists, and other necessary data. All parts shall be numbered or otherwise clearly identified to facilitate ordering or replacements. Descriptions of all operations control devices and their specific functions shall also be included.

1.07 FACTORY TESTS

Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for

the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:

Testing performed upon each pump shall include the following inspections:

1. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.

2 The input KW, speed, power factor, no load current, and torque characteristics shall be certified.

3. Impeller, motor rating and electrical connections shall first be checked for compliance to the specifications.

4. A motor and cable insulation test for moisture content or insulation defects shall be made.

5. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

6. The pump shall be run for 30 minutes submerged, a minimum of 6 feet under water.

7. After the operational test described in line No. 6, the insulation test described in line No. 4 shall be performed again.

8. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.

A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump as part of the shop drawing submittal process.

PART 2 PRODUCTS

2.01 PUMP REQUIREMENTS

The pump(s) shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater and shall be fully guaranteed for this use. The pumps provided shall be capable of operating in an ambient liquid temperature of **104 DEGREES F**. Since the high temperature of **104 DEGREES F** is specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM), motors with a maximum ambient temperature rating below **104 DEGREES F** shall not be acceptable.

The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor shall not be acceptable.

The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

2.02 PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of

blow holes or other irregularities. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

2.03 EQUIPMENT FEATURES

A. COOLING SYSTEM

(Cooling Jacket Equipped)
If required by FLYGT, each unit shall be provided with an integral motor cooling system. A motor cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures of up to 104°F. (40°C.). Operational restrictions at temperatures below 104°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable.

B. CABLE ENTRY SEAL
The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

C. MOTOR
The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.The stator shall be heat-shrink fitted into the cast iron

stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C. ambient and shall have a NEMA Class B maximum operating temperature rise of 80° C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

D. BEARINGS

The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.

E. MECHANICAL SEALS

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either

a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

F. PUMP SHAFT

For the NP-model pumps:

The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

For the CP-model pumps:

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be carbon steel ASTM A 572 and shall be completely isolated from the pumped liquid.

G. IMPELLERS

For the NP-model pumps:

The impeller shall be of gray cast iron, ASTM A-48 Class 35B, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 6% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The Impeller shall be locked to the shaft and held by an impeller bolt.

For the CP-model pumps:

The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs. Impeller(s) shall be keyed to the shaft, retained with an Allen head bolt

H. VOLUTE/SUCTION COVER

For the NP-model pumps:

The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable volute insert ring containing spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide the relief path and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multi-vane semi-open impeller and the volute. The insert ring shall be cast of (ASTM A-48 Class 35B cast iron or ASTM A 532 (Alloy lll A), 25% chrome cast iron)

For the CP-model pumps:

Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

I. PROTECTION

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**
The thermal switches and FLS shall be connected to a Mini CAS (Control And Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

J. EXPLOSION-PROOF PUMPS:

The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by a U.S. nationally recognized testing laboratory

(U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of operating in pumped media up to **104 DEGREES F**. Motor thermal switches shall monitor and protect the motor from excessive temperature. An internal Float Switch shall be available, as an option, in the motor chamber. Service of explosion-proof submersible units shall be performed by qualified FM experienced personnel. **The pump manufacturer must provide training schools to qualify personnel in the proper service and repair of explosion proof pumps.**

K. MIX FLUSH SYSTEM:

Each pump shall be furnished and installed with the ITT Flygt mix flush valve.

L. GUIDE SYSTEM

The pumps shall be provided with a guide system to allow easy removal of the pumps without entering the wet well. Two guide bars shall be provided extending from the top slab of the pump station to the discharge connection of each pump and shall assist in raising and lowering the pump unit. The discharge connection shall be bolted to the floor and shall serve as a lower attachment for the guide bars. The working load of the lifting system shall be 50% greater than the pump unit weight.

The pump unit shall be guided on the bars by a guide bracket which shall be an integral part of the pump. Each pump shall be fitted with sufficient length of stainless steel chain capable of lifting the pump and motor. The necessary fittings and eye bolts shall be provided.

PART 3 EXECUTION

3.01 INSTALLATION

The CONTRACTOR shall furnish and install the pumps at the locations shown on the Contract Drawings and in accordance with the pump manufacturer's specification and recommendations. All discharge elbows shall be mounted on concrete pedestals prepared for them and over anchor bolts set in the concrete. Pump pedestals shall be carefully set at proper elevation, location and alignment, and leveled after which they shall be properly grouted in with grout filling the entire underside of the base. Grouting shall be as recommended by the manufacturer. All piping shall be brought to the pump connection in such manner as to prevent the possibility of applying any loads or stresses to pump connections.

3.02 ANCHOR BOLTS AND FASTENERS

Anchor bolts, nuts, washers, and fasteners shall be furnished with the equipment herein specified and set in conformance with templates or drawings also supplied by the manufacturer. All anchor bolts, studs, fasteners, washers, and nut shall be Type 316 stainless steel. The CONTRACTOR shall install all anchor bolts, studs, washers, nuts and fasteners required to complete the work of this Contract.

3.03 SAFETY GUARDS

All exposed shafts, couplings, belts, etc., shall be provided with removable, rigidly constructed and mounted protective safety guards, meeting in full the requirements of the OSHA standards, State safety standards and all local codes or ordinances that my apply. Guards shall be designed to facilitate access for lubrication, maintenance, and/or belt replacement.

3.04 PAINTING

Unless otherwise specified, all mild steel parts not buried in concrete, cadmium plated, galvanized or plastic covered, shall be shop primed with one coat of paint recommended as compatible with finish coats by the manufacturer whose paint is to be used for field painting. Stainless steel, aluminum, brass, bronze, galvanized or cadmium plated steel, and plastic covered parts will not be painted. Machined and finished surfaces shall be protected with a suitable lubricant to prevent rusting.

The CONTRACTOR shall, under this Section, remedy all damage to shop coatings after installation of equipment, and to the satisfaction of the ENGINEER.

3.05 TOOLS AND LUBRICANTS

The CONTRACTOR shall furnish a complete set of any special tools required for the maintenance and operation of this equipment, as designated by the equipment manufacturer.

3.06 FIELD TEST AND START-UP SERVICE

The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for 8-hour working day(s) at the site to inspect the installation and instruct the owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the contractor shall have the manufacturer do the following:

a. Megger stator and power cables.
b. Check seal lubrication.
c. Check for proper rotation.
d. Check power supply voltage.
e. Measure motor operating load and no load current.
f. Check level control operation and sequence.
g. Insurance that the connection between the pump and discharge connection does not leak. If the connection leaks, the discharge elbow shall be replaced by the pump manufacturer at no cost to the supplying CONTRACTOR or OWNER
h. Compliance with operating conditions specified for flow rate and TDH: At least 2 draw down tests will be conducted for each pump, and parallel pumping at each wetwell to determine average discharge pumping rate. CONTRACTOR shall provide necessary personnel and equipment to assist ENGINEER in measuring wetwell depths during testing. CONTRACTOR shall be solely responsible for making all arrangements for scheduling tests, and having adequate personnel and potable water for testing and start up.

3.07 ADJUSTING, TESTING, TRAINING AND ADDITIONAL SERVICES

In addition to the tests listed under this Section, each pump together actual motors shall be fully tested in water at the pump manufacturers' works to establish that all rating conditions have been met. The CONTRACTOR shall make all remedial work necessary on any or all pumps should they fail to meet the conditions specified at no extra compensation. Pumps shall then be retested and failure to meet the specified conditions after remedial work has been performed may be cause for rejection of the pumps.

On completion of the work, the entire pumping equipment shall be lined up, operated and adjusted by qualified representatives of the several pump and control manufacturers, and under the intended operating conditions, and shall be left in first class, satisfactory, operating conditions, ready for continuous and satisfactory operation. The CONTRACTOR shall furnish all power, oil, fuses and other supplies for the field testing of the pumps, equipment, controls, and appurtenances, together with the services of the manufacturer's representatives.

3.08 PUMP WARRANTY

The pump manufacturer shall submit the proper documentation demonstrating that the pump manufacturer warrants the pumps being supplied to the OWNER against defects in materials and workmanship for a period of five (5) years or 10,000 hours under a Municipal Wastewater Permanent Installation Warranty.

END OF SECTION

SECTION 16000

LIFT STATION ELECTRICAL WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

WORK described in this section shall consist of furnishing, installing, and connecting all panels, motor control center, lighting fixtures, and all other equipment shown or otherwise indicated in the DEVELOPMENT DRAWINGS. This section shall provide minimum, general guidelines and requirements; all and any electrical plans shall be designed by a qualified, registered electrical engineer in the state of Georgia.

1.02 CODES AND STANDARDS

A. WORK performed under this section shall conform to the latest edition of the National Electrical Code.

B. Equipment and material furnished under this section shall be new, unused, and shall be manufactured to the following standards:

1. I.E.E.E. - Institute of Electrical & Electronic Engineers.

2. A.N.S.I. - American National Standards Institute.

3. U.L. - Underwriters Laboratories, Inc.

4. I.C.E.A. - Insulated Conductor Engineers Association.

1.03 POWER SERVICE

A. In general the power service to the pump stations shall be three phase as listed below:

1. 480/277V, 3 phase, 4 wire, Wye connected

2. 120/208V, 3 phase, 4 wire, Wye connected

3. 120/240V, 3 phase, 4 wire, Delta connected

4. 480V, 3 phase, 3 wire open Delta connected (contact the power company for motor horsepower limitation)

5. 120/240V; 3 phase, 4 wire, open Delta connected (contact the power company for motor horsepower limitation)

B. For pump stations with motors 10Hp and smaller, single phase power service may be provided with written approval from the City.

A letter from the power company state that three phase power is not available at the location must be submitted to the City with the request.

If the City approves the request for single phase power service, variable frequency drives shall be used in the pump control panel for the ump motors. The variable frequency drives shall have single phase input and three phase output. The pump motors shall be three phase.

C. Use of phase converters and single phase pump motors will not be permitted.

PART 2 PRODUCTS

2.01 STATION APPURTENANES

A. A main circuit breaker shall be provided in the pump station and shall be located inside the fenced area of the station. The circuit breaker shall meet the following requirements:

1. U.L. listed for service entrance.

2. In NEMA-4X stainless steel enclosure.

3. Capable of being padlocked in both “on” and “off” positions.

B. Underground conduits shall be scheduled 40 PVC. All exposed conduits shall be rigid galvanized steel.

C. No conduit runs or junction boxes shall be installed inside or on top of the wet well. Splicing of cables inside the wet well will not be permitted.

D. The power, lighting and control cables shall be copper conductors with 600V type ‘XHHW’ insulation, #12 AWG minimum size. The signal cables shall be copper conductors, 600V rated, twisted and shielded type, #16 AWG minimum size.

E. A surge suppressor shall be provided at the power service entrance. The surge suppressor shall have voltage characteristics to match the power service.

The surge suppressor shall be in NEMA-4X stainless steel enclosure and shall provide line to lien, line to neutral, line to ground and neutral to ground protection modes as applicable for the power service.

The surge suppressor shall be provided with a disconnect. Minimum surge current rating shall be 100KA per mode, 200KA per phase per NEMA LS-1. The surge suppression system shall be duty cycle tested to survive 20KV, 10KA, IEEE C62.41 category surge current with less than 5% degradation of clamping voltage.

The surge suppressor shal have minimum repetitive surge capacity of 4500 impulses per mode. Status indicating lights and form ‘C’ dry alarm contacts shall be provided.

The surge suppressor shall be U.L. listed and labeled under UL1449 and UL1283. Acceptable manufactures are Liebert and Current Technology.

F. A mini-power center shall be provided in the pump station when the power service is 480 volts. The mini-power center shall be in an outdoor weatherproof enclosure which shall consist of a transformer with primary and secondary circuit breakers and a 120/240V panel board. The panel board shall have at least two spare branch circuit breakers.

G. The electrical equipment shall be mounted on an adequately sized galvanized steel or aluminum structure. Telemetry RTU shall also be installed on this structure. Large pump control panels shall be installed on concrete pad.

H. A ground fault circuit interrupter type outlet in weatherproof enclosure shall be provided on the mounting structure fro the City's use.

I. A ground grid consisting of a minimum four ¾" diameter, 10' long copperweld rods at the corners of the fenced area connected with minimum #2 AWG bare stranded copper conductor run underground around the perimeter shall be provided. All the grounding connections shall be exothermic type. Mechanical connection are not permitted. The main circuit breaker, generator and the pump station fence shall be grounded to the ground grid.

J. Each site shall have an exterior hinged light pole with 250 watt metal halide luminaire, 120 volt ballast, photoelectric control, with heat and impact resistant lens. Pole is to be architectural brown and is to be supplied with lowering winch.

BRACKET: G.E. PART # RBSU2H6PP
POLE: G.E. PART # ASHTS202T-5.3-11PP

2.02 TELEMETRY SYSTEM

2.03 PUMP CONTROL PANEL

A. Pump control panel enclosure shall be NEMA-4X stainless steel with a hinged front door and an inner swing door. Selector switches, indicating lights, elapsed time meters, etc. shall be mounted on the inner swing door.

B. Circuit breakers shall be thermal-magnetic with adequate short circuit ratings. Motor circuit protector type circuit breakers may be used for motors.

C. Motor starters shall be full voltage non reversing or solid state reduced voltage type as required by design. The minimum starter size shall be NEMA size 1. The solid state reduced voltage starters shall be provided with an integral bypass contactors and either an isolation contactor on the line side or a breaker with shunt trip.

D. Six digit elapsed time meter shall be provided for each pump.

E. Control power transformers shall be provided to obtain 120V and 24V control power as required.

F. A phase monitor shall be provided to monitor low voltage, phase loss and phase reversal.

G. A weatherproof, shatterproof red alarm light fixture shall be provided on panel top to indicate alarm conditions.

H. The pump level control system shall consist of Flygt catalog #FMC200 controller and Flygt catalog #LS-100 level sensor. A spare level sensor shall be provided for each pump station. A high level float shall be provided as a backup to the level sensor.

I. The following alarm/status contacts shall be provided for connection to the Telemetry RTU:

- Wetwell Low Level
- Wetwell High Level
- Pump #1 Run
- Pump #2 Run
- Pump(s) Fail
- Phase Loss
- Surge suppressor failure (via form C dry contact in suppressor)
- Generator transfer
- Generator Common Alarm (low fuel, low oil, fail start)
- Level Sensor

J. A final As-Built drawing encapsulated in mylar shall be provided and kept in the inside of the front door.

K. The panels shall be fabricated in UL-508 approved facility and shall bear U.L. label.

L. The panels shall be factory tested and certified by the Panel Fabricator. The panels shall be guaranteed for minimum of one year from the date of acceptance by the City.

PART 3 EXECUTION

3.01 GUARANTEES AND TESTS

A. WORK shall be guaranteed for 12 months after date of acceptance. WORK shall be free from improper grounds and short circuits.

B. DEVELOPER is required to test new pump stations with generator prior to acceptance of the facility with manufacturer's representatives.

END OF SECTION

SECTION 16621

STANDBY POWER GENERATOR

PART 1 GENERAL

1.01 SCOPE OF WORK

A. WORK described in this section shall consist of furnishing a standby power generator.

B. DEVELOPER shall furnish all material and labor to perform the work.

1.02 CODES AND STANDARDS

A. WORK performed under this section shall conform to the latest edition of the National Electrical Code.

B. Equipment and material furnished under this section shall be new, unused, and shall be manufactured to the following standards:

1. I.E.E.E. - Institute of Electrical and Electronic Engineers

2. A.N.S.I. - American National Standards Institute

3. U.L. - Underwriters Laboratories, Inc.

4. I.C.E.A. - Insulated Conductor Engineers Association

PART 2 PRODUCTS

2.01 STANDBY GENERATOR

A. The standby generator shall be rated for continuous standby service for the full load demand of the station. This shall include running both pumps with staggered startups.

B. The generator shall be housed in a weatherproof enclosure. Quiet site soundproofing shall be provided to reduce noise to the following levels at a distance of 7 meters:

- 60dB for Natural Gas Generators
- 68dB for Diesel Generators up to 80KW
- 74dB for Diesel Generators above 80KW

C. The entire standby generator set shall have a manufacturer’s warranty for a minimum period of five (5) years from the date of acceptance.

D. Outdoor weather-protective housing with critical grade exhaust muffler shall be installed. The housing shall have hinged side access doors and a rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted

with the manufacturer's standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided. The generator must be mounted far enough away from obstructions to allow all doors to be opened 90°. All conduits and gas lines shall be installed underground.

E. Generator shall be supplied with all auxiliary systems necessary for operation such as batteries, battery charger, block heater, etc.

F. The standby power system shall include an automatic transfer switch. Transfer switch shall be rated for 100% of full load of the main disconnect switch.. Switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment. The switch must be selectable for load or no load.

G. Three complete sets of O & M manuals and keys shall be provided for generator and automatic transfer switch.

H. Generator control system must include a programmable control device to allow automatic start-up and test functions. Test functions can be programmed for daily, weekly or monthly testing. Connections for remote monitoring of function and failure must be provided.

I. Pump stations are required to have continuous standby power. All gas piping and connecting equipment shall be installed in accordance with the Georgia State Amendments to the Standard Gas Code, latest edition. All gas supply lines must include a drip loop as well as all other equipment required for a safe and complete hook-up.

Generators above 100 KW shall be diesel powered with 100 gallons minimum fuel storage capacity or 24-hour operating time, which ever is greater. Fuel storage shall be accomplished by the use of corrosion –resistant double wall sub-base fuel tank only, no underground storage will be allowed. A leak detection device shall be provided in the interstitial space for sensing fuel leakage. The device contact shall be connected to the generator control panel terminals for telemetry.

J. Generators can be obtained from the following manufacturers/representatives:

a. Cummins-Onan
b. Kohler
c. Caterpillar

K. Transfer switches shall be in NEMA-4 enclosures obtained from the manufacturer of the generator.

PART 3 EXECUTION

3.01 TESTING

A. Services of manufacturer's authorized representative shall be provided for supervision of the installation, check-out and start-up.

B. Generator shall be load tested at 100% full load on site for a period of four hours using resistive load banks. Notify the City inspector prior to test, and provide certification letter from the manufacturer.

C. Upon completion of the check-out and testing, the manufacturer's representative shall provide written certification that the system has been properly installed, tested and is functioning properly.

3.02 INSTRUCTIONS

Provide after the successful testing one "Instructions and Training Session" with the Owner's designated personnel. Give instructions on operation, function and maintenance.

Provide three (3) sets of complete Operation and Maintenance Manuals and Keys.

3.03 SYSTEM SERVICE CONTRACT

Provide for Owner's consideration a copy of the manufacturer's standard service contract after the successful start-up.

END OF SECTION