

TABLE OF CONTENTS

<u>Section/Item</u>	<u>Title</u>	<u>Page</u>
CITY DWM TECHNICAL SPECIFICATIONS		
<u>DIVISION 1 – GENERAL REQUIREMENTS</u>		
01010	Summary of Work	01010-1
01040	Coordination	01040-1
01055	Construction Staking	01055-1
01060	Regulatory Requirements	01060-1
01091	Codes and Standards	01091-1
011400	Work Restrictions	011400-1
01320	Construction Photography	01320-1
01350	Project Document Tracking and Control System	01350-1
01351	Public Relations and Communications	01351-1
01400	Quality Assurance/Quality Control	01400-1
01410	Testing Laboratory Services	01410-1
01500	Field Offices and Sheds	01500-1
01510	Temporary Facilities	01510-1
01540	Security and Safety	01540-1
01550	Traffic Regulation	01550-1
01610	Transportation and Handling	01610-1
017123	Construction Surveying	017123-1
<u>DIVISION 2 – SITE WORK</u>		
02000	Site Work	02000-1
02050	Demolition	02050-1
02110	Clearing and Grubbing	02110-1
02125	Temporary and Permanent Erosion and Sedimentation Control	02125-1
02150	Sheeting, Shoring and Bracing	02150-1
02200	Earthwork	02200-1
02223	Excavation below Normal Grade and Crushed Stone Refill	02223-1
02225	Trench Excavation and Backfill	02225-1
02302	Granite Curbs	02302-1
02371	Green Infrastructure Geotextiles	02371-1
02521	Concrete Sidewalks, Wheelchair Ramps, Curbs and Gutters	02521-1
02535	Reinforced Concrete Storm Drain Pipe	02535-1
02536	Reinforced Concrete Sanitary Sewer Pipe	02536-1
02537	Ductile Iron Sanitary Sewer Pipe	02537-1
02538	Sewer Service Connections	02538-1
02539	Abandonment of Existing Sewers	02539-1

02545	Polyvinyl Chloride Gravity Sewer Pipe	02545-1
02600	Wastewater Flow Control	02600-1
02607	Manholes, Junction Structures, Catch Basins and Inlets	02607-1
02616	Polyethylene Encasement of Ductile Iron Pipe	02616-1
02641	Precast Concrete Manholes	02641-1
02650	Testing for Acceptance of Sanitary Sewers	02650-1
02655	Sewer System Cleaning and Television Inspection	02655-1
02665	Water Mains and Accessories	02665-1
02666	Temporary Water Mains and Accessories	02666-1
02668	Water Service Connections	02668-1
02671	Bioretention Areas and Bioswales	02671-1
02675	Disinfection of Water Mains	02675-1
02676	Abandonment of Existing Water Mains	02676-1
02681	Subdrainage for Stormwater Quality Facilities	02681-1
02682	Pretreatment for Stormwater Quality Facilities	02682-1
02700	Removing and Replacing Pavement	02700-1
02900	Trees, Plants and Ground Covers	02900-1
02920	Site Restoration	02920-1
02922	Amended Soil and Mulch	02922-1
02933	Seeding and Sodding	02933-1
02934	Native Plug Planting	02934-1
02949	Stormwater Planters	02949-1

DIVISION 3 - CONCRETE

03100	Concrete Formwork	03100-1
03200	Concrete Reinforcement and Doweling	03200-1
03250	Concrete Joints	03250-1
03300	Cast-In-Place Concrete	03300-1
03410	Precast Concrete Structures	03410-1
03600	Grout	03600-1

DIVISION 4 - MASONRY

04000	Masonry	04000-1
-------	---------	---------

DIVISION 5 - METALS

05500	Miscellaneous Metal	05500-1
-------	---------------------	---------

DIVISION 6, 7, 8, 9, 10, 11, 12, 13, and 14

Not Used

DIVISION 15 – MECHANICAL

15100	Valves and Appurtenances	15100-1
15150	Water Supply Backflow Prevention Assemblies	15150-1

DIVISION 16

Not Used

REMEDICATION SPECIFICATIONS PREPARED BY AMEC FOSTER WHEELER**DIVISION 01 - GENERAL REQUIREMENTS**

01 11 00	Summary of Work for Demolition and Remediation
01 20 00	Price and Payment Procedures for Demolition and Remediation
01 31 00	Project Management and Coordination for Demolition and Remediation
01 35 29	Health and Safety for Demolition and Remediation
01 40 00	Quality Requirements for Demolition and Remediation
01 57 00	Temporary Controls for Demolition and Remediation

DIVISION 02 – EXISTING CONDITIONS

02 26 00	Regulated Building Material Assessment
02 41 17	Building Demolition
02 61 14	Excavation of Impacted Soils
02 61 15	Stabilization of Excavated Impacted Soils
02 61 17	Stockpiling and Loading of Impacted Materials
02 76 13	Well Abandonment
02 80 13	Regulated Building Material Removal and Disposal
02 81 00	Transportation and Disposal of Impacted Materials

DIVISION 31 - EARTHWORK

31 23 19	Dewatering
31 23 43	Backfilling and Grading for Remediation

+++ **END OF TABLE OF CONTENTS** +++

**SECTION 01010
SUMMARY OF WORK**

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work to be performed under this Contract consists of furnishing and installing all labor, materials, tools, equipment and incidentals required to complete the Work.
- B. All work shall be as specified and in accordance with the City of Atlanta, Department of Watershed Management and Department of Public Works standards.

1.02 PROJECT LOCATION

The Work of this Contract is located in the City of Atlanta, Georgia, as shown in the Drawings included as part of the Technical Requirements.

1.03 SCOPE OF WORK

- A. The Work of this Contract is outlined in the Technical Requirements and generally includes the following:
 - 1. Landscape Design services to indicate suitable places for replacement trees subject to the approval of the City Arborist.
 - 2. Coordination with existing utilities and relocating, as necessary.
 - 3. Abandonment of existing utilities including water lines, sewers, storm drains, and appurtenances.
- 4. Furnishing and installing new utilities and appurtenances, as required.
- 5. Installing and transferring service connections, where required.
- 6. Connecting new utilities to existing, where required.
- 7. Earthwork associated with pond grading and improvements.
 - 8. Plantings on the Project site.
 - 9. Temporary and permanent erosion and sedimentation control.
- 10. Traffic control during construction.

11. Right-of-way restoration, including pavement replacement.
12. All associated miscellaneous work, including site restoration and cleanup.
 - B. The Contractor shall furnish and install all labor, materials, equipment and incidentals which are reasonable and properly inferable and necessary for the proper completion of the work, whether specifically indicated in the Contract Documents or not.
 - C. The Contractor shall perform the work complete, in place and ready for continuous service and shall include repairs, replacements and restoration required as a result of all damages that occur as a result of construction under this contract.

1.04 WORK COORDINATION

- A. The Contractor shall coordinate his/her work with all public and private utilities. The Contractor shall ensure that all utilities in each street are field marked by the utility owner or designated agent prior to beginning any excavation in that street.
- B. The Contractor shall also coordinate his/her work with owners of private and public property where access is required for the performance of the work. Legal access will be acquired and provided by the City DWM.

1.05 CONDITIONS OF THE SITE

- A. The Contractor shall make all necessary investigations to determine the site conditions in the project area and any unique features that may affect the prosecution of the work.
- B. The Contractor will be held responsible for any damage to and for maintenance and protection of existing utilities and structures.

1.06 PARTIAL CITY DWM OCCUPANCY

The existing facilities or pipelines to which these improvements are being made or connected to will remain in operation during construction.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

(NOT USED)

+++ END OF SECTION 01010 +++

**SECTION 01040
COORDINATION**

PART 1 GENERAL

1.01 SUMMARY

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

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 CUTTING AND PATCHING

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

3.02 COORDINATION

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

3.03 CITY DWM'S RESPONSIBILITIES

All existing water system valves shall be located, uncovered as necessary and operated by the City DWM.

3.04 PROTECTION AND RESTORATION OF WORK AREA

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

the work site.

- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.
- F. Swamps and Other Wetlands
 - 1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
 - 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.
 - 3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
 - 4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.
- G. Refer to Section 02920.

3.05 WATER FOR CONSTRUCTION PURPOSES

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

3.06 EXISTING UTILITIES AND OBSTRUCTIONS

- A. The Contractor shall call the Utilities Protection Center (UPC) (800-282-7411) as required by Georgia Law (O.C.G.A. Sections 25-9-1 through 25-9-13) and shall call all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.

B. Existing Utility Locations: The following steps shall be exercised to avoid interruption of existing utility service.

1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure, at the time of any excavation that a valid utility location exists at the point of excavation.
2. Expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the City DWM an updated copy of the log bi-weekly, or more frequently if required.

C. Conflict with Existing Utilities

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed improvement does not permit safe installation by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may propose an alignment change of the proposed improvement to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written notification to and acknowledgement of the City DWM. Where such realignment is denied by the City DWM, the Contractor shall arrange to have the utility, main, or service relocated.
2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed improvement does not permit the crossing without immediate or potential future damage to the utility, main, or service. The Contractor may change the proposed grade of the proposed improvement to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written notification to and acknowledgement of the City DWM. Where such relocation is denied by the City DWM, the Contractor shall arrange to have the utility, main, or service relocated.

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

or other obstructions.

E. Water and Sewer Separation

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

3.07 PIPE DISTRIBUTION

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. Distribution and stringing of pipe along the route will be limited to the total length which will be installed in one work day/work shift. The City DWM reserves the right to reduce the distance in residential and commercial areas based on the effects of the pipe distribution on the adjacent property owners.
- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

3.08 CONSTRUCTION OPERATIONS

The Contractor shall ensure that all work areas and roadways are free from excess excavated material, debris, mud, soil, rocks, etc. at the end of each work day. Contractor shall be responsible for sweeping all areas at the end of each work day.

+++ END OF SECTION 01040 +++

**SECTION 01055
CONSTRUCTION STAKING**

PART 1 GENERAL

1.01 SCOPE

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

1.02 QUALITY ASSURANCE

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

1.03 SUBMITTALS

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

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

- A. The City DWM may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.

3.02 GENERAL

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

3.03 STAKING PRECISION

- A. The precision of construction staking shall match the precision of components location indicated on the Contractor's design drawings. Staking of utilities shall be done in accordance with standard accepted practice for the type of utility.
- B. The precision of construction staking required shall be such that the location of the water main or sewer or storm drain can be established for construction and verified by the Contractor. Where the location of components of the water main or sewer or storm drain, (i.e., fittings, valves, manholes, road crossings, etc.) are not dimensioned, the establishment of the location of these components shall be based upon scaling these locations from the Contractor's design drawings with relation to readily identifiable land marks, i.e. survey reference points, power poles, manholes etc.
- B. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with grades shown on the Contractor's design drawings shall be identified and confirmed by the Contractor and prior to constructing the base.
- C. The Contractor's attention is directed to Section 01040.

3.04 RECORD DRAWINGS

- A. Water Mains
 - 1. The Contractor shall submit record drawings which show the final installed location of water mains and survey data for all installed pipe, valves and fittings, appurtenances, and service connections 3-inches in diameter and greater. Coordinates (x, y, and z) shall be obtained for each joint of pipe, valve, fitting, and appurtenance.
 - 2. In addition, the location of all valves and fittings and main tap location for service connections 3-inches in diameter and greater shall be indicated by at least 2 ties (measured distances) from permanent fixed objects within the public right of way, as accepted by the City DWM, to allow the City DWM to locate the water main and components in the future without the use of GPS instruments.
- B. Sewers and Storm Drains
 - 1. The Contractor shall submit record drawings which show the final installed location of the sewer and storm drain and survey data for all installed sewer and storm drain pipe, tunnel and casing limits and service connections. Survey data shall consist of final coordinates for all manholes, catch basins, tunnel and casing limits and service connections and invert elevations for all manholes, catch basins and other structures.
 - 2. In addition, the location or station of all sewer service connection tie-in points to the main line sewer shall be indicated on the Contractor's design drawings, as

accepted by the City DWM, to allow the City DWM to locate the service connections in the future without the use of GPS instruments.

- C. The record drawings shall also indicate the horizontal and vertical location, dimensions and materials of all utilities encountered during excavation.

- D. Two full size hard copies of record drawings shall be furnished to the City DWM for review. Each record drawing shall be stamped with the name of the Contractor, signed and dated by the Contractor's Project Manager and signed, sealed and dated by the Surveyor. Also provide 2 compact disks containing signed and sealed PDFs of the final record drawings.

+++ END OF SECTION 01055 +++

**SECTION 01060
REGULATORY REQUIREMENTS**

PART 1 GENERAL

1.01 SCOPE

- A. Permits and Responsibilities: The Contractor shall be responsible for complying with all applicable federal, state, county and municipal laws, codes and regulations, in connection with the prosecution of the Work and for obtaining all permits including but not limited to NPDES permits for storm water discharges from the Work site.
- B. Permits and applications for this project are identified in PART 3 of this Section.
- C. The Contractor shall comply with all requirements of the permitting authority, whether permits were obtained by the Contractor or not.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 NPDES PERMITS FOR STORM WATER DISCHARGES

The Contractor shall comply with the provisions of the Authorization to Discharge under the National Pollutant Discharge Elimination System, Storm Water Discharges Associated with Construction Activity for Stand Alone Construction Projects, Georgia Environmental Protection Division General Permit No. GAR 100001, including but not limited to filing permit applications, filing Notice of Intent (NOI), filing Notice of Termination (NOT), performing inspections and monitoring and performing record keeping as required.

3.02 GDOT ENCROACHMENT PERMITS

Not used.

3.03 CITY LANE CLOSURE PERMITS

Contractor will submit permit applications to the City's Department of Public Works, Office of Transportation for all lane closures required for completion of the project. Refer to Section 01550.

3.04 OTHER PERMITS

The Contractor shall submit applications for and obtain all other permits required in conjunction with completion of the Work.

3.05 GENERAL

- A. The Contractor shall pay for all remaining permits, fees and licenses required for construction of the Project.
- B. The Contractor shall examine all permits and conform to the requirements contained therein, including the purchase of additional bonds or insurance as specified therein, and such requirements are hereby made a part of this Contract as though the same were set forth herein. Failure to examine the permit and agreement applications will not relieve the Contractor from compliance with the requirements stated therein.

++ +END OF SECTION 01060 +++

**SECTION 01091
CODES AND STANDARDS**

PART 1 GENERAL

1.01 DESCRIPTION

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in paragraph 1.02 of this Section.

1.02 STANDARD ORGANIZATIONS

- A. Piping and Valves:

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute
MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute

B. Materials:

AASHTO American Association of State Highway and Transportation Officials
ANSI American National Standards Institute
ASTM American Society for Testing and Materials

C. Painting and Surface Preparation:

NACE National Association of Corrosion Engineers
SSPC Steel Structures Painting Council

D. Aluminum:

AA Aluminum Association
AAMA American Architectural Manufacturers Association

E. Steel and Concrete:

ACI American Concrete Institute
AISC American Institute of Steel Construction
AISI American Iron and Steel Institute
CRSI Concrete Reinforcing Steel Institute
NRMA National Ready-Mix Association
PCA Portland Cement Association
PCI Pre-stressed Concrete Institute

F. Welding:

ASME American Society of Mechanical Engineers
AWS American Welding Society

G. Government and Technical Organizations:

APHA American Public Health Association
APWA American Public Works Association
ASCE American Society of Civil Engineers
ASQC American Society of Quality Control
ASSE American Society of Sanitary Engineering
CFR Code of Federal Regulations
CSI Construction Specifications Institute
EPA Environmental Protection Agency
FS Federal Specifications
ISEA Industrial Safety Equipment Association
ISO International Organization for Standardization
ITE Institute of Traffic Engineers
MUTCD Manual of Uniform Traffic Control Devices

NBFU National Board of Fire Underwriters
NFPA National Fluid Power Association
NBS National Bureau of Standards
OSHA Occupational Safety and Health Administration
SPI Society of the Plastics Industry, Inc.
USDC United States Department of Commerce
WEF Water Environment Federation

H. Roadways:

AREMA American Railway Engineering and Maintenance-of-Way Association
GDOT Georgia Department of Transportation

I. Plumbing:

AGA American Gas Association
PDI Plumbing Drainage Institute
SPC SBCC Standard Plumbing Code

J. Equipment:

AFBMA Anti-Friction Bearing Manufacturers Association, Inc.
AGMA American Gear Manufacturers Association
OPEI Outdoor Power Equipment Institute, Inc.
PTI Power Tool Institute, Inc.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

(NOT USED)

+++ END OF SECTION 01091 +++

SECTION 01 14 00
WORK RESTRICTIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Site access and security
 2. Work hours
 3. Subsequent grading operations
 4. Protection of community and public streets

1.02 SITE ACCESS AND SECURITY

- A. Contractor's use of the premises shall be limited to the Work being performed under the Contract Documents. Confine all operations, including the storage of materials, to the designated areas of the Site as shown on the Drawings, or as otherwise approved in writing by the Owner and Engineer. Contractor shall be responsible for arranging for and paying the costs of any necessary off-site storage.
- B. Contractor shall be responsible for the security and safety of Contractor's equipment and facilities. The Owner and Engineer will not be liable for loss or damage of Contractor's tools, equipment or materials, whatever the cause.
- C. Perimeter gates shall be used as the primary Site access (identified on the Drawings). Entrances shall be maintained to provide safe and efficient traffic flow.
- D. Provide security and facilities to protect the Work and existing facilities from unauthorized entry, vandalism or theft. Initiate security program at job mobilization and maintain the security throughout the duration of the Work.
- E. The Owner will provide security areas outside of the perimeter fence to protect the Site from unauthorized entry, vandalism and theft during the performance of the Work. However, the Owner assumes no responsibility for the Contractor's equipment, supplies, or personnel. Contractor shall implement additional security measures as needed to protect its equipment, supplies, and personnel. Security measures provided by the Owner will include the following:
- F. Security measures provided by the Owner will include the following:
1. Liaison with local, state and federal law enforcement agencies, and fire and rescue.
 2. Coordination with local medical service providers on-site and off-site to direct emergency responder personnel to the Site for accidents or incidents.

- G. Site security shall be provided and maintained 24 hours per day for the duration of the Work in order to restrict unauthorized access to the site. The Security Officer shall be on the site during active clean-up operations. A security guard shall be on site at all other times. The Security Office shall be maintained in the Contractor's facilities.
- H. Vehicular access to the site shall be restricted to authorized vehicles only. Allow entrance only to authorized persons with proper identification. Maintain a log of security incidents. Require all visitors having access to the site to sign in and sign out on a log. Visitors shall include on the log their name, organization, purpose of visit, and the time of entry and departure from the Site.
- I. All approved visitors to the Site shall be briefed on safety and security and provided with temporary identification and safety equipment by the Contractor's SHSO, and escorted by the Contractor throughout their visit.
- J. Do not allow cameras on site or photographs taken except by written approval of Owner.
- K. Maintain records of security-related incidents in compliance with all applicable laws and regulations, and submit monthly reports as described below:
 - 1. Incidents to be recorded include, but are not limited to: thefts, robberies and burglaries; evidence of unlawful Site entry; security barrier destruction or damage; severe weather, bomb threats, and other Site disturbances; contacts and responses of federal, state and local law enforcement agencies; and contacts and responses of local medical service providers for accidents and medical emergencies.
 - 2. Incidents shall be documented on forms approved by the Engineer and Owner.
 - 3. Summaries of the recorded incidents shall be included in monthly reports and submitted to the Engineer and Owner.
- L. Contractor shall be responsible for any damage to roadways, facilities, or structures on, or adjacent to, the Site due to negligence, carelessness, actions, errors or omissions on the part of the Contractor.

1.03 WORK HOURS

- A. Normal Work hours shall be in accordance with applicable ordinances, laws and regulations of authorities having jurisdiction. Normal Work hours shall be from no earlier than 6:00 A.M. to no later than 7:00 P.M., Monday through Saturday, and subject to availability of adequate daylight to safely perform the Work.
- B. Work hours established by any ordinance, law or regulations of the City of Atlanta and other authorities having jurisdiction shall supersede the requirements of this Section.
- C. Any variation from Normal Work hours or work on Sundays or Holidays will require notice to the Engineer no less than 48 hours prior to any necessary variation from Normal Work Hours, to allow for adequate review and coordination of staff. Contractor's notice to Engineer shall include Work activities to be conducted outside of Normal Work Hours, the hours and days that those activities will be conducted, and the requested duration of the change in Normal Work Hours.
- D. Should community traffic conditions become impaired, schedule movements of equipment into and out of the site between midnight and 5:00 AM.

1.04 OTHER RESTRICTIONS AND REQUIREMENTS

- A. No equipment in contact with soils that have not been remediated is permitted on streets or clean gravel access ways at any time.
- B. On a daily or more frequent basis during dry weather, areas with soils awaiting remediation activities shall be moistened to prevent dust.
- C. No standing water is permitted for more than 24 hours anywhere within the perimeter fence(s). Storm water collected in low areas of non remediated soils shall be pumped to the remediation pond.
- D. Swales and surface drainage diversions shall be inspected daily and immediately after rainfall events. All obstructions to the free flow of surface drainage shall be removed.
- E. Obtain a Notice of Intent with Georgia EPD and abide by the requirements stipulated by Georgia EPD. At no expense to the Owner, comply with all requirements of NPDES compliance.
- F. Before discharging pond water to the public sewer; sample, test, and retest the discharge if need arises. When pollutant concentrations exceed Owner's MCLs, allow at least 48 hours before retesting.
- G. Comply with all City of Atlanta codes and ordinances at all times.
- H. There are no areas on the site which will not be graded during subsequent construction activities. Should temporary facilities be placed on the site, Contractor shall remove utility connections, security check points, trailers, or any other facilities placed on the site at no expense to the Owner. Contractor is solely responsible for securing off-site spaces for temporary facilities it requires at no additional cost to the Owner.

- I. Some low areas are known to pond during wet weather. Contractor shall inspect low areas on Vine or other Street(s) during wet weather, place cones around the perimeter of the ponded area, and remove cones after each rain event. The City will not operate and maintain any drainage inlets at any time, nor warrants the condition of existing inlets or other drainage facilities.
- J. Brick sewers shall be protected from equipment at all times. Removal of materials above brick sewers will be either by hand, or scraped away without applying weight atop the brick sewers below.
- K. Materials in contact with materials to be demolished such as tree roots, stumps, curbs and gutters, graded aggregates beneath streets, meter boxes, and all other materials to be hauled off-site shall be free of contaminated soils which they may have been in contact with.
- L. Obtain haul route permit(s) from the Owner and clearly indicate the materials to be hauled off-site and public roads to be used. Maintain a log of each and every load of material to be hauled off-site.
- M. No vehicles are permitted to park on City Streets.
- N. Local traffic in the community shall not be interrupted at any time. Allow local traffic to pass without any delay.
- O. Do not allow traffic on City streets to be blocked by turning movements. Stagger times of truck movements into or away from the site. Make movements into or out of the site during non-peak traffic hours or between midnight and 5:00 AM to the extent possible.
- P. Do not block community driveways or delay any mail deliveries.
- Q. Respond to any community complaints and advise the City of what measures going forward will help minimize repeat complaints going forward.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

**SECTION 01320
CONSTRUCTION PHOTOGRAPHY**

PART 1 GENERAL

1.01 SCOPE

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

1.02 PRE AND POST CONSTRUCTION PHOTOGRAPHY

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

1.03 PROGRESS PHOTOGRAPHS

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

PART 2 PRODUCTS

2.01 PHOTOGRAPHS

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

PART 3 EXECUTION

3.01 SUBMITTALS

- A. No construction shall start until pre-construction photography has been completed and accepted by the City DWM.
- B. A minimum of ten photographs shall be submitted with each application for payment. The view selection will be as determined by the City DWM. Photographs shall be submitted in electronic format acceptable to the City DWM.
- C. Construction photographs shall be submitted with each payment request. Failure to include photographs may be cause for rejection of the payment request.

- D. The Contractor shall be responsible for all discrepancies not documented in the pre-construction videos and photography.

+++ END OF SECTION 01320 +++

SECTION 01350
PROJECT DOCUMENT TRACKING AND CONTROL SYSTEM

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall utilize the City of Atlanta, Department of Watershed Management's Project Document Tracking and Control System (DTCS). The primary function of the system is to facilitate timely processing and approval of all contract documentation in coordination with the overall Project Schedule established by these Specifications and the Contractor. This system will utilize Primavera Contract Manager (formerly known as Primavera Expedition®) for document tracking and control and Lynx Photo Management software. The Primavera Contract Manager software will:
1. Facilitate communication among the City DWM and Contractor;
 2. Facilitate turn-around time with regard to responses and approvals;
 3. Provide a central location for all Project information to facilitate all Project participants in performing their tasks based on the latest Project data;
 4. Provide a standard system of project administration with accountability.
- B. The Contractor shall be required to utilize the web-based DTCS system that resides on the City DWM's server to generate documents in the proper format for submission to the City DWM. The Contractor shall access the system through the internet using a compatible web browser from the Contractor's administrative field office location, and/or other locations where work associated with the Project is being performed.
- C. The Contractor shall be required to generate Project documents and records utilizing the aforementioned system. The Contractor shall be required to transmit and submit the Project documents within the system to the City DWM.
- D. The Contractor shall utilize a high capacity scanner capable of scanning 11 x 17 documents, double sided, on site for the entire duration of the Project. All documents must be scanned in and attached to the appropriate Contract Manager document, including submittals, shop drawings, O&M's and all other documents requested by the City DWM.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall utilize the DTCS to create and maintain Project documents, including, but not limited to the following:
1. Company Directory: Addresses, Phone Numbers, Personnel Contacts, etc.
 2. Drawings Log: Current Drawing revision log
 3. Submittals (Integrated with Project Schedule through Activity codes)
 4. Transmittals
 5. Requests for Information and Answers (RFIs)
 6. Change Documents, Including:
 - a. Requests for Proposal (RFPs)
 - b. Work Authorization Requests (WARs)
 - c. Work Authorizations (WAs)
 - d. Change Order Requests (CORs)
 - e. Change Orders (CO)
 - f. Design Clarifications (DC)
 7. Daily Reports (Daily Diaries)
 8. Field Decisions & Clarification Memos
 9. Notice of Non-Compliance
 10. Construction Issue Memos
 11. Punchlists
 12. Meeting Minutes & Agendas
 13. Correspondence
 14. Work Plans
 15. Start-up Plans
 16. Equipment Operation and Maintenance Training
 17. Spare Parts
 18. Progress Payment Applications
 19. Grading Plan
 20. Demolition and Utility and Services Abandonment Plan
 21. Plantings Plan
- B. The Contractor shall utilize the complete capabilities of the DTCS to meet the requirements of this Section. The Contractor shall provide a highly trained and experienced construction project controls person knowledgeable in construction work sequencing, productivity, scheduling and application of the Primavera Contract Manager software system. This person, along with the Contractor's management team, shall work closely with the City DWM to deliver the documents outlined in this Section.

3.02 SOFTWARE SUPPORT

- A. The Contractor is to provide for a one day training class in the base bid for the Lynx PM software for ten personnel, seven for Atlanta DWM and three for the Contractor. Type of class to be determined by the Atlanta DWM. The Contractor may contact a Lynx PM Representative at 1-877-955-7711.
- B. The Contractor shall be required to establish an internet connection using DSL or better to connect to the DTCS to permit the forwarding and receipt of documents.
 - 1. The Primavera Contract Manager software supports the following Email programs, and the Contractor is to utilize:
 - (a) Microsoft Outlook 2003
 - (b) Microsoft Outlook 2007
 - 2. The Contractor shall also provide 2 days of consulting services in the base bid for troubleshooting and maintenance of the DTCS at any location designated by the Atlanta DWM or at the Contractor's administrative field office (if authorized by the Atlanta DWM). Troubleshooting, maintenance, upgrade, configuration, and set up shall be performed by Evans Technology or their authorized representative based on a scope pre-defined by the Atlanta DWM. The Contractor shall utilize the custom data fields, dictionaries, and coding systems as required by the Atlanta DWM.
- C. The Contractor shall be required to attend a 2-day training session on the operation of the City DWM's DTCS, provided by a Primavera Authorized Trainer. The Contractor shall provide the training session for ten participants (fee for the Primavera Authorized Trainer). The training session shall be held at the Evans Technology, Alpharetta, Georgia facility and shall be attended by the Contractor (limited to three participants) as well as representatives of the City DWM (seven participants). The Contractor shall be responsible for the cost of training for additional members of their firm or future retraining, as may be deemed necessary by the Contractor.
- D. The Contractor shall meet with the City DWM within 15 days after the Contract is awarded to discuss access requirements and the Contractor's plan to utilize DTCS and execute the document control functions herein.
- E. Access through the internet to the DTCS shall be operational within 30 days following the pre-construction meeting date. This must be operational from the contractor's administrative field office location.

3.03 COMPANY DIRECTORY

- A. The Contractor and the City DWM will monitor and manage the Company Directory. The directory must include Company name, Company abbreviation, contact names, address, phone numbers and e-mail addresses.

3.04 DRAWING LOG

- A. The City DWM will maintain a log of initial “issued for construction” drawings in the DTCS. Information shall include drawing number, title and revision number.
In addition to logging the initial project drawing list, the City DWM will maintain a log on the DTCS of all subsequent revisions to these drawings and any sketches resulting from clarification memos, RFIs, field orders and Change Orders. It is the Contractor’s responsibility to utilize the latest drawings and sketches in the performance of the work.

3.05 SUBMITTALS/SHOP DRAWINGS

- A. Requirements: The Contractor will utilize the DTCS to log and track submittals, as well as generate associated transmittal letters.
- B. Submittals & Product Data:
 - 1. A list of all required submittals will be entered into the DTCS by the Contractor. Submittals shall be incorporated into packages, with numbering as follows: XXXXX-YYY, where X denotes the applicable specification section; Y denotes the individual submittal number for that particular specification section, beginning with 001.
 - 2. The Contractor will log and track all submittals utilizing the DTCS. Each review cycle shall be entered into the DTCS. The Contractor shall identify as activities in the CPM schedule, specified in SC-16, to include all data submittals, as well as those involving complex reviews and long lead deliveries, and all procurement items required for construction activities. Submittal schedule information shall be updated monthly with the Contractor’s updated project CPM schedule.
- C. Samples: A list of all required sample submittals will be entered into the DTCS by the Contractor. Sample submittals shall be identified as individual submittals within the submittal packages with numbering as specified above.
- D. Guarantees/Warranties: A list of all required Guarantee/Warranty submittals will be entered into the DTCS by the Contractor. These submittals shall be identified as individual submittals within the submittal packages with numbering as specified above.

- E. Work Plans, Start-up Plans, O&M Submittals and Spare Parts: All testing, Start-up and O&M submittals will be entered into the DTCS by the Contractor. These submittals shall be identified as individual submittals within the submittal packages identified with numbering as specified above.
- F. Submittal Procedures: The Contractor shall prepare all submittal packages utilizing the submittal numbering system, description and packaging conventions described above. Submittals prepared by the Contractor, which fail to follow the conventions described above, will be returned “amend and resubmit”. Should the Contractor determine that a submittal is required and is not covered by the listing within the DTCS, consultation with the City DWM to determine the submittal number, description and packaging will be required.

3.06 CORRESPONDENCE

- A. The City DWM shall monitor and manage the correspondence, Non-Compliance Notices, Field Decisions & Clarification Memos and Construction Issue Memo logs. The Contractor is responsible for generating Project correspondence within the DTCS, and forwarding the correspondence to the City DWM.

3.07 TRANSMITTAL LOG

- A. The Contractor and the City DWM will monitor and manage the transmittal log. All Project transmittals shall be created electronically, automatically sequentially numbered and logged into the DTCS system as they are created. The Contractor is responsible for utilizing the system to create transmittals for items transmitted to the City DWM and other subcontractors.

3.08 REQUEST FOR INFORMATION & ANSWERS

- A. The Contractor shall be responsible for generating RFIs on the DTCS system. The Contractor shall notify the City DWM when an RFI is submitted. The City DWM will monitor and manage the RFI log. The City DWM will generate an Answer document in response to each RFI and forward them to the Contractor. The DTCS will track “Ball in Court” for all RFIs and Answers, as well as date of original generation and response date. In addition the RFIs will reference the relative Specification Section and Drawings. The DTCS will identify the date of the request and the originator, responsible party for a response and the date of the response.

3.09 CHANGE DOCUMENTS

- A. Change documents include Request for Proposals (RFPs), Work Authorization Requests (WARs), Work Authorizations (WAs), Change Orders Requests(CORs),

and Change Orders (COs). All change documents will be monitored and managed by the City DWM utilizing the DTCS. The DTCS will track “Ball in Court” status of all change documents.

3.10 DAILY REPORTS

- A. The Contractor is responsible for creating daily reports utilizing the DTCS. The Contractor is required to enter the Daily Reports into the DTCS by 10:00 a.m. of the subsequent day that the Contractor or any subcontractor performs work. All daily reports shall be logged into the DTCS by the Contractor. The Contractor shall also provide one signed hard copy of all daily reports on a weekly basis. Required information shall include Contractor, Date, Day, Temperature, Precipitation, Sky, Wind, Work Activity, Equipment, Field Force, Visitors, Materials, and Scheduled Activities utilizing the Primavera schedule activity codes. Daily reports which fail to link work activities to the active Primavera schedule will not be acceptable.

3.11 PUNCLISTS

- A. The City DWM will monitor and manage punch lists, and will create Punchlists to be forwarded to the Contractor. The Contractor shall address the Punchlist items that have been assigned to the Contractor and forward updates to the City DWM. Once accepted as complete, the City DWM will access the punchlist in the DTCS and close it out.

3.12 MEETING MINUTES AND AGENDA

- A. The Contractor shall monitor and manage the meeting minute process. The Contractor will forward meeting minutes to the City DWM electronically. The Contractor will log the meeting minute items into the DTCS within 3 days of the meeting date.

3.13 PROGRESS PAYMENTS /REQUISITIONS FOR PAYMENT

- A. The Contractor is responsible for creating progress payment applications directly from the Primavera scheduling software and then forwarding them to the City DWM electronically along with hard copies by 4:00 p.m. at the end of each update/billing period. The Contractor shall also simultaneously provide a separate submittal of the updated Primavera progress schedule (P5 or latest version at the time of purchase). All Progress Payments and schedule of values shall be developed as defined in the Special Conditions Required information within the Pay Application shall be coordinated with the City DWM's Project Manager. Maintenance of the “As Built” record documents by the Contractor shall be verified before processing will be approved. Failure of a Contractor to maintain project record documents, maintain current and properly prepared daily

reports or to submit the project schedule update will be just cause for withholding of the monthly or final payment.

3.14 LYNX PHOTO MANAGEMENT SOFTWARE

- A. The Lynx PM software shall be utilized by the City DWM and the Contractor for the duration of the project. The daily construction photographs will be the permanent visual record of the pre-construction conditions, daily construction site activities, and the completion of construction work. The Contractor must submit to the City DWM no less than four record photos for each activity ID listed in the project schedule per the last schedule update. Applicable photos must accompany each Pay Application.

+++ END OF SECTION 01350 +++

**SECTION 01351
PUBLIC RELATIONS AND COMMUNICATIONS**

PART 1 GENERAL

1.01 SCOPE

The Contractor shall provide all labor, materials, equipment and incidentals required to meet the requirements and responsibilities related to public relations and communications as specified hereinduring performance of the Work.

1.02 STAFFING

- A. The Contractor shall employ one (1) full time Public Information Officer (PIO) whose specific duties and job shall be to perform customer service related functions and to continuously coordinate and provide information and services as required by the City’s Office of Public Relations and Communications and other City staff as necessary.
 - 1. PIO must have had the responsibilities of receiving, logging, tracking, responding and resolving customer/citizen complaints and claims, providing notices to and personal interaction with affected customers/citizens regarding project impact and projected work schedules of the Contractor, reviewing project schedules and “look-ahead” to determine projected areas of impact from the Work.
 - 2. PIO must have a minimum of one (1) year of experience in performing this type of work on similar projects.

- B. The City shall provide a Public Information Manager (PIM) whose specific duties and job shall be to perform customer service related functions and to continuously coordinate and provide information and services as required by the City’s Office of Public Relations and Communications and other City staff as necessary.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 PUBLIC INFORMATION KICK-OFF MEETING

- A. Prior to commencement of Work and following the preconstruction conference, the Contractor, PIO and the City DWM shall attend a public information meeting hosted by City Council members whose districts will be impacted by construction and the Office

of Public Relations and Communications. At this meeting the following items will be discussed:

1. Contractor's responsibilities.
2. Contractor's relationship with the City's Office of Public Relations and Communications and the City DWM.
3. Functions and responsibilities of the Public Information Officer (PIO) employed by the Contractor as required under paragraph 1.02 above. The Contractor's PIO and backup individual shall be identified to the Customer Care Call Center with 24/7 PIO contact telephone numbers provided.

3.02 RESPONSIBILITIES OF THE PUBLIC INFORMATION OFFICER

A. Responsibilities of the Public Information Officer (PIO) shall include, but not be limited to, the following elements:

1. Receiving, logging, tracking and resolving customer/citizen complaints and claims either received directly or by the City and providing periodic updates and reports as specified.
2. Providing notice to affected customers/citizens in the event there are scheduled service outages or other work elements required for the performance of Work that are scheduled which will have an impact on the neighborhood or property owners.
3. Attendance and participation in scheduled project progress meetings for discussion, updates and resolution to customer/citizen complaints, claims, review of schedules and other matters as required.
4. In the event Work is required on private property where an easement has been acquired, the PIO shall notify the property owner at least fourteen (14) days in advance of commencement of the Work in writing.
5. Prior to commencement of work in any neighborhood, the PIO shall provide notice to the customers/citizens thirty (30) days in advance. In addition, twenty-four (24) hours prior to actual commencement of the work, the PIO shall notify the customers/citizens via door or mailbox hanger as hereinafter provided for in this Section.
6. The PIO shall be on twenty-four (24) hour call, seven (7) days a week and be equipped with a mobile phone. In the event of the PIO being unavailable, the Contractor shall designate a second individual to handle the responsibilities and functions who shall be fully familiar and aware of the duties and prosecution of the work.

7. The Contractor/PIO must report all complaints to the Customer Care Call Center (404-658-6500) and to the City's PIO within six (6) hours of receipt. Conversely, all calls received by the Customer Care Call center will be transmitted to the City's PIO within forty-eight (48) hours of receipt and the PIO must perform follow-up within twenty-four (24) hours with resolution after receipt of the notice. Upon receipt of the information the Customer Care Call Center will create a file to document the incident.
8. The PIO shall assist the Contractor's Traffic Control Officer in coordination of all street closures, detours and traffic pattern changes with the Public Involvement Officer and the Department of Public Works and the GDOT. As required above, the PIO must provide notice to the affected areas in advance of the scheduled closures, detours and traffic pattern changes.
9. In the event there is an emergency involving the public or a situation where media inquiries and responses are possible, the PIO shall be notified immediately. The PIM will then coordinate with the City's Media Relations Manager for appropriate action. **Under no circumstance shall any employee, Subcontractor or vendor of the Contractor make any comments to the media regarding the project at any time.**

3.03 CUSTOMER SERVICE TRACKING SOFTWARE

- A. The Contractor shall use the City's Document Tracking and Control System (DTCS), as specified in Section 01350, to track and enter information from customers/citizens regarding complaints, claims and inquiries. All related information shall be updated on a daily basis by the PIO. Tracking information and responses shall be coordinated with the PIM.
- B. Reports shall be provided as weekly updates on all activities and on specific cases within twenty-four (24) hours when requested.
- C. Information recorded shall include but not be limited to the following:
 1. Date complaint/claim/inquiry received.
 2. Name, address and telephone number of individual filing complaint/claim/inquiry.
 3. Nature of complaint/claim/inquiry.
 4. Address where problem is located if different than above.
 5. Action required, date, action taken, date action completed.
 6. Follow-up with person who filed under 2 above to verify satisfaction or status.
 7. Documents associated with actions taken.

8. Any information regarding resolution with the Contractor's, Subcontractor's or vendor's insurance company shall be fully documented.

3.04 IDENTIFICATION BADGES AND SECURITY

- A. All members of the Contractor's staff and his subcontractor's permanent staff at or above the level of foreman who will be working on-site will be issued an ID badge by the City. The ID badge will list the worker's name and company affiliation and will include a picture. All members will go to the Office of Safety & Security to have their ID's made.
- B. It shall be the Contractor's responsibility to collect the ID badges from any employee who is discharged or resigns prior to completion of the project as well as at completion of the project so that all ID badges are returned to the Office of Security and Safety. The Contractor will be charged a fee of \$25.00 per badge for any badge not returned at completion of the project. For any ID badges lost during the term of the project that must be reissued, there will be a charge of \$15.00 per ID badge. The Contractor shall deduct these charges from his periodic or closeout payment request or the City will deduct.
- C. Since lower level personnel of the Contractor, Subcontractor or vendor will not be issued ID badges, the Contractor must maintain a daily sign-in sheet for daily workers under his supervision. The Contractor must be able to identify any employee on the site as a bona fide worker if asked and if not able to identify, the City DWM will direct the Contractor to remove the individual from the site
- D. The Contractor shall develop a security plan for use on the job site during construction. The plan shall include, as a minimum, the use of pre-employment background checks and drug tests, crime prevention and anti-theft procedures, workplace violence and care of project documents. All staff working on the site shall be familiar with the requirements of the Security Plan.
- E. City ordinances prohibit the carrying of weapons on City streets. Any person bringing weapons to the jobsite shall be removed immediately.
- F. All of the Contractor's staff at or above the level of foreman shall attend a 4-hour mandatory Security Training session conducted by the Office of Security and Safety. Multiple training sessions will be offered and staff must complete the training at least within 1 month of commencing work on the jobsite. All costs associated with the training will be considered as incidental to the Contract.
- G. Persons on the jobsite shall report any suspicious activity by workers or by others at the jobsite area first to the Atlanta Police Department by calling 911 and then immediately to the Director of Security and Safety.

3.05 DOORHANGERS

- A. The Contractor shall produce door hangers required for notice to customers/citizens and residents from the template provided by the PIM (SEE EXAMPLE AT END OF THIS SECTION) as specified hereinabove in paragraph 3.02. Door hangers shall be utilized for notification in the event of, but not limited to, the following events:
 - 1. Planned service disruption/outages
 - 2. Road closures/detours/traffic pattern changes
 - 3. Access/entrance to property
 - 4. Work start-up
 - 5. Blasting

3.06 IMPACTED AREA ADDRESS DATABASE

- A. The Contractor shall provide the Office of Communications and Public Outreach with a database of addresses and phone numbers (and names if available) of all project impacted residences, businesses and facilities at least three (3) weeks prior to project start-up. The database will be used by the PIM for regular citizen communications and notifications.
- B. The Contractor shall copy the PIM on all correspondence and Right of Entry Agreements with citizens and property owners.

3.07 SCHEDULE

- A. The PIO and PIM shall be provided a copy of the detailed CPM project construction schedule. The PIO will provide notification to the impacted area at least two (2) weeks prior to project start-up.
- B. The Contractor shall inform the PIM through the weekly progress meetings of any project schedule changes or changes in “disruptive work” such as blasting, road closures, etc., that would have significant impact on citizens or require prior citizen notification.

3.08 MEDIA RELATIONS AND JOB SITE INQUIRIES

- A. As specified above in paragraph 3.02, only authorized persons shall release any information to media inquiries. The Contractor’s field personnel shall at all times have project information cards available that will be provided to media and citizens if inquiries are made on-site. All inquiries shall be directed to the person referred to on the card and citizens shall be referred to the PIO and/or PIM.

- B. Project information cards shall be produced by the Contractor from the template provided by the PIM. (SEE EXAMPLE AT END OF THIS SECTION)

3.09 TRAINING

All of the Contractor's staff at or below the level of superintendent shall attend a mandatory Public Relations Training and Protocol Procedures Training. The purpose of this training is to teach construction crews on how to deal with citizens, the media, etc. and how to conduct themselves on the jobsite. This training is approximately one (1) hour in length and will be facilitated by City staff at a designated City facility. Training will be provided at no cost to the Contractor.

3.10 VEHICLE SIGNS AND PROJECT SITE SIGNAGE

- A. The Contractor shall place pre-approved magnetic signs on all job-site project vehicles. The signage template will be provided by the PIM with the signs to be produced by the Contractor.
- B. All project sites shall have pre-approved project signs in accordance with the template provided by the PIM and signs produced by the Contractor. Some of the signs shall be mounted on moveable skids so they can be relocated as the project progresses on various streets in project area.

3.11 NOTIFICATIONS

- A. The Contractor shall provide the following notifications as required by the PIM:
 - 1. Anticipated work start date must be three (3) weeks prior so PIM may send out two (2) week notice mailer.
 - 2. Service disruptions-notify PIM and Call Center at least 72 hours in advance so that 48 hour notice may be issued; notice to citizens via door hangers and/or automated phone message 24 hours prior to disruption.
 - 3. Street Closure or Partial Closure-notify PIM and Call Center at least 72 hours in advance to permit 48 hour automated phone message; notify fire, police other emergency services and other authorities 24 hours prior to street closure.
 - 4. Significant work in neighborhood- blasting, directional drilling, trenchless installation, open cut, etc.-door hangers or automated phone messages are required-notify the PIM and Call Center at least 72 hours in advance to permit 48 hour automated phone message; notification to citizens via door hangers and/or automated phone messages 24 hours in advance.
- B. The Contractor shall be fully responsible for notification to all emergency related services for detours, closures (partial or full) or traffic pattern changes and as such they must be

detailed in their traffic control plan and implemented through the Contractor's Traffic Control Manager and per all permitting requirements. Refer to Section 01550.

- C. The Contractor shall be fully responsible for distributing all notifications a minimum of 48 hours in advance of service outages for schools, nursing homes hospitals, medical clinics, assisted living facilities or other types of facilities and shall also make personal contact with facility representatives no later than 60 minutes prior to the outage.
- D. The Contractor shall at all times coordinate with the PIM and Call Center to provide detailed schedules and street locations for service disruptions or street closures to ensure that Call Center is well equipped to provide adequate response to citizen inquiries.

+++ END OF SECTION 01351 +++

Sample Door Hanger



**NOTICE OF SEWER
SYSTEM IMPROVEMENT WORK**
City of Atlanta
Department of Watershed Management

The City is pleased to announce that we are moving forward with plans to fix our sewer system to meet state and federal requirements.

We are now at the point where construction activities are about to begin on your street for the South River Capacity Relief Projects. These planned improvements will reduce the incidents of sewage backups, leaks and sanitary sewer overflows.

The particular work planned for your street is checked below.

- OPEN-CUT CONSTRUCTION
- TUNNELING
- SMOKE TESTING
- ROAD CLOSURES AND/OR DETOURS
- OTHER _____

We will do our best to minimize any inconvenience to you. All personnel are required to wear Clean Water Atlanta identification badges. If you have any questions or concerns, please contact William Horton, the Public Information Manager for this project at 770-294-3240 or call the Clean Water Atlanta Help Line at 404-529-9211.

**If you have any questions, please call the
Department of Watershed Management
Helpline at 404-529-9211.**

Sample Project Information Card (Tri-Fold)

City will enter into an easement agreement with the owner. The City's real estate agents are currently negotiating access agreements with the affected property owners.

Sewer separation contractors may use different technologies to construct the new sewers; including open-cut and tunnel construction. Neighborhoods in the separation area will experience some disruption, such as partial or complete street closures, traffic rerouting, storage of materials and equipment near construction sites, brief interruptions in sewer service, dust and noise. The City will take every practical measure to reduce disruption during the sewer separation projects.

If you have any concerns about work in your area or would like additional information, you contact the Project Help Line at 404-529-9211 or visit the City's Public Information Office located at 290 M.L.K. Blvd., Suite 103. The office is open from 8:00 am to 5:00 pm, Monday through Friday.



City of Atlanta
Shirley Franklin
Mayor

City Council
Lisa Borders
President

Carla Smith
Kwanza Hall
Ivory Young
Cleta Winslow
Natalyn Archibong
Anne Fauver
Howard Shook
Clair Muller
Felicia Moore
C.T. Martin
Jim Maddox
Joyce Sheperd
Cesar Mitchell
Mary Norwood
H. Lamar Willis



Stockade Project Information Card

COMBINED SEWER OVERFLOW REMEDIATION PROGRAM

The federal Environmental Protection Agency and state Environmental Protection Division have approved the City's plan to eliminate water quality violations from combined sewer overflows (CSOs). This plan includes a combination of deep-rock storage tunnels, new treatment facilities and the separation of combined sewers in selected basins- Greensferry, McDaniel and the Stockade sub-basin portion of the Intrenchment Creek basin.

You live in the Stockade Basin. Work in this basin extends roughly as far south as Lester Avenue, as far east as Stovall Street (north of I-20) or Ormewood Terrace (South of I-20), as far north as Decatur Street and as far west as Boulevard. Sewer separation construction activities commenced on May 1, 2006 and are slated for completion by December 2007.

WHAT HOMEOWNERS MIGHT EXPERIENCE DURING SEWER SEPARATION

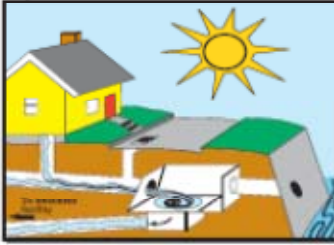
Most of the homes and businesses in the Greensferry, McDaniel and Stockade areas are connected to a combined sewer system. The combined system will be converted to a separated sewer system under the federal consent decree program. Sewer separation involves constructing new sanitary or storm sewers within a combined sewer service area. This allows wastewater and stormwater, currently collected in the same pipe, to be collected in separate pipes. The wastewater would be carried to an existing treatment plant where pollutants are removed before discharge to the South River. Separately treated stormwater would be collected and discharged to a local stream.

The Department of Watershed Management has been working with elected officials and community leaders to keep affected residents and business owners update about this project and to address specific neighborhood concerns.

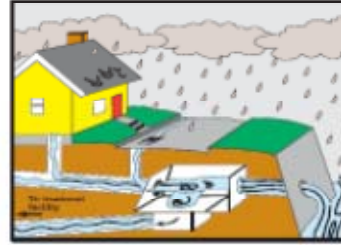
Most of the existing combined sewers run beneath city streets but some were constructed in areas that are now private property. If a sewer is on private property and there is no existing easement, the

EXISTING COMBINED SEWER SYSTEM

Dry Weather



When It Rains



In a combined sewer system, domestic sewage combine with stormwater in the same pipe. In the event of heavy rains, the stormwater can cause an overflow into a receiving stream.

AFTER SEPARATION

Dry Weather



When It Rains



In a separate sewer system, domestic sewage and stormwater flow into separate pipes. The sewage is diverted to a wastewater treatment plant and storm water is released untreated to a receiving stream.

**Sample Door Hanger
(Two-Sided)**



Date: _____

Date: _____

Dear Water Customer:

Dear Water Customer:

Because of maintenance/repairs to the water system in your community, your service will be briefly interrupted on:

Because of maintenance/repairs to the water system in your community, your service will be briefly interrupted on:

Date: _____

Date: _____

Time: _____

Time: _____

Your service will be restored at approximately:

Your service will be restored at approximately:

We apologize for the inconvenience and assure you that our efforts will help ensure clean, safe water for Atlantans and our downstream neighbors for generations to come.

We apologize for the inconvenience and assure you that our efforts will help ensure clean, safe water for Atlantans and our downstream neighbors for generations to come.

Thank you for your understanding.

Thank you for your understanding.

Please call 404-658-7220 if you have concerns or questions regarding this work.

Please call 404-658-7220 if you have concerns or questions regarding this work.

Watershed Management Representative

Watershed Management Representative

City of Atlanta
Department of Watershed Management
55 Trinity Avenue, S.W., Suite 5400
Atlanta, GA 30303

City of Atlanta
Department of Watershed Management
55 Trinity Avenue, S.W., Suite 5400
Atlanta, GA 30303

Sample Project Information Card

(Tri-Fold Outside)



Here are some suggestions for dealing with discoloration at your taps:

- Allow the water to run for a few minutes.
- Do not use hot water during this time to prevent sediment from entering and settling in your hot water heater.
- If the discoloration persists for longer than an hour, call 404.658.7220 to report the condition.

Questions or Concerns?

Project Helpline - 404.589.3070
www.atlantawatershed.org
www.facebook.com/atlwatershed
www.twitter.com/atlwatershed



City of Atlanta
Kasim Reed
Mayor

City Council
Ceasar C. Mitchell
President

- Carla Smith
- Kwanza Hall
- Ivory Young
- Cleta Winslow
- Natalyn Archibong
- Alex Wan
- Howard Shook
- Yolanda Adrean
- Felicia Moore
- C.T. Martin
- Keisha Lance Bottoms
- Joyce Sheperd
- Michael Julian Bond
- Aaron Watson
- H. Lamar Willis



Water Distribution System Improvements

The City of Atlanta's Department of Watershed Management is embarking on a program to improve its existing water distribution system. The water distribution system covers approximately 640-square-miles and provides service to residents and businesses in Atlanta, Sandy Springs and South Fulton County. The system is comprised of over 2,500 miles of distribution mains and approximately 25,000 hydrants.

The purpose of the system improvements is to increase water flow & pressures, eliminate water quality issues and increase pipe capacity to satisfy minimum pipe diameter standards.

Upgrades to the water system will take place in approximately 50 selected areas of the system within Atlanta city limits. Improvements will consist of the installation of 100,000 feet of new eight-inch to 16-inch water mains. New hydrants within the existing right-of-way will also take place while existing undersized water mains and hydrants will be abandoned. New service connections will also be provided to water customers after the new mains have been installed, tested and disinfected. These enhancements

Sample Project Information Card

(Tri-Fold Inside)

will be completed under four separate construction contracts. Each contract will cover a separate quadrant of the City (Southeast, Southwest, Northwest and Northeast).

Construction is slated to begin April 2011 for the Southeast area and expected to last one year. Construction for the three remaining contracts will begin in 90-day intervals, with an expected completion date of January 2013.

What to Expect?

Construction – The installation of the new water pipes will require open-cut construction. You will notice crews drilling to break the asphalt and using heavy machinery to install the new pipes. Some dust accumulation on plants, patio furniture and parked cars, can result.



Obstruction of Traffic – There will be temporary lane closures and blocked

intersections to allow crews to work safely in the roadway. Detour signs will be posted when necessary. Please exercise caution as you travel through project areas.

Water Main Breaks /Water Service Disruptions – The probability of a water main break is greater where construction is in progress simply because of the use of heavy machinery near buried utility pipes. When a water main breaks, water service to the area is suspended temporarily to allow repair of the pipe. Customers will also experience a scheduled service disruption when water service is transferred from the old mains to the new mains.

Water Discoloration – Distribution mains and connection pipes that supply water service to homes and businesses are made of iron. As they age, these pipes accumulate iron sediment. Under normal conditions, water flows in one direction in the pipes and sediment is never noticed. However, any interruption of water flow in your pipes; i.e., water shut-off, opening of a hydrant or valve can lead to some water discoloration. When the water is turned off and back on again, the water in the mains reverses flow as a result of pressure changes, causing sediment to dislodge and mix with the water. The discolored water is not harmful to your health, and usually the

water will return to normal within one hour of the disturbance.

Low Water Pressure – This is another effect of sediment mixing with water when the water is turned off during an interruption and turned back on again. As the sediment flows with the water through your tap, it clogs the filter screen located at the mouth of the tap. This blockage will reduce the water flow. Removing the screen and rinsing out the sediment usually addresses this issue.

Water Pressure Surge – When water service is transferred to the new mains, water pressure is significantly enhanced, causing water to enter service pipes at an increased rate. This pressure surge can cause your service pipes to break. Ensure that your service pipes are in good condition and talk to your plumber about installing a pressure reducing valve to safeguard your pipes and fixtures.

SECTION 01400
QUALITY ASSURANCE/QUALITY CONTROL

PART 1 GENERAL

1.01 SCOPE

This section includes requirements for the implementation of the Contractor's quality assurance and quality control program.

1.02 SITE INVESTIGATION AND CONTROL

- A. Contractor shall check and verify all dimensions and conditions in the field continuously during construction. Contractor shall be solely responsible for any inaccuracies built into the Work due to Contractor's and subcontractor's failure to comply with this requirement.
- B. Contractor shall inspect related and appurtenant Work and report in writing to the City DWM any conditions that will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all Site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor solely and entirely at Contractor's expense.

1.03 INSPECTION OF THE WORK

- A. All work performed by the Contractor and subcontractors shall be inspected by the Contractor and non-conforming Work and any safety hazards in the work area shall be noted and promptly corrected. The Contractor is responsible for the Work to be performed safely and in conformance to the Contract.
- B. The Work shall be subject to inspection by representatives of the City DWM acting on behalf of the City DWM to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The City DWM or any inspector(s) shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
- C. The presence of the City DWM, or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract. Compliance is the responsibility of the Contractor. No act or omission on the part of the City DWM, or any inspector(s) shall be construed as relieving Contractor of this responsibility. Inspection of Work later determined to be non-conforming shall not be cause or excuse for acceptance of the non-conforming Work. The City DWM may accept non-conforming Work when adequate compensation is offered and it is in the City DWM's best interest as determined by the City DWM.

- D. All materials and articles furnished by the Contractor or subcontractors shall be subject to rigid documented inspection, by qualified personnel, and no materials or articles shall be used in the Work until they have been inspected and accepted by the Contractor's Quality Control representative and the City DWM or other designated representative. No Work shall be backfilled, buried, cast in concrete, covered, or otherwise hidden until it has been inspected. Any Work covered in the absence of inspection shall be subject to uncovering. Where uninspected Work cannot be easily uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal, and reconstruction under proper inspection at the Contractor's expense.
- E. All materials, equipment and/or articles furnished to the Contractor by the City DWM shall be subject to rigid inspection by the Contractor's Quality Control representative before being used or placed by the Contractor. The Contractor shall inform the City DWM, in writing, of the results of said inspections within one working day after completion of inspection. In the event the Contractor believes any material or articles provided by the City DWM to be of insufficient quality for use in the Work, the Contractor shall immediately notify the City DWM.

1.04 TIME OF INSPECTION AND TESTS

- A. Samples and test specimens required under these Specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. The Contractor shall furnish and prepare all required test specimens at Contractor's own expense.
- B. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover any Work under this Contract, the City DWM shall be notified not less than three work days in advance to request inspection before beginning any such Work of covering. Failure of the Contractor to notify the City DWM at least three work days in advance of any such inspections shall be reasonable cause for the City DWM to order a sufficient delay in the Contractor's schedule to allow time for such inspection. The costs of any remedial or corrective work required, and all costs of such delays, including its impact on other portions of the Work, shall be borne by the Contractor.

1.05 SAMPLING AND TESTING

- A. The Contractor shall retain and pay for an independent materials testing agency approved by the City DWM. This independent testing agency will develop and submit a testing plan for quality assurance on each type of work activity. The testing agency will document the processes and procedures utilized to verify and maintain quality work. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the most current standards, as applicable to the class and nature of the article or materials considered. However, the City DWM reserves the right to use any generally accepted system of inspection which, in the opinion of the City DWM, will ensure the City DWM that the quality of the workmanship is in full accord with the Contract.

- B. The City DWM reserves the right to abbreviate, modify the frequency of or waive tests or quality assurance measures, but waiver of any specific testing or other quality assurance measure, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract.
- C. Notwithstanding the existence of such waiver, the City DWM shall reserve the right to make independent investigations and tests as specified in the following paragraph and failure of any portion of the Work to meet any of the qualitative requirements of the Contract, shall be reasonable cause for the City DWM to require the removal or correction and reconstruction of any such Work.
- D. In addition to any other inspection or quality assurance provisions that may be specified, the City DWM shall have the right to independently select, test, and analyze, at the expense of the City DWM, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed provided that wherever any portion of the Work is discovered, as a result of such independent testing or investigation by the City DWM, which fails to meet the requirements of the Contract, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such Work shall be borne by the Contractor.

1.06 CONTRACTOR'S QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

- A. The Contractor shall establish and execute a Quality Assurance/Quality Control (QA/QC) program for the services that are being procured from the Contractor. The program shall provide the Contractor with adequate measures for verification and conformance to defined requirements by the Contractor's personnel and subcontractors (including fabricators and suppliers). This program shall be described in a Plan responsive to this Section. It shall utilize the services of an independent testing agency/company that is industry certified to provide quality assurance and compliance with the standards specified.
- B. The Contractor shall furnish the City DWM a project specific QA/QC Plan. The Plan shall contain a comprehensive account of Contractor's QA/QC procedures as applicable to this job. The Contractor shall furnish for review by the City DWM, no later than 14 days after receipt of notice to proceed, the QA/QC plan proposed to be implemented. The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. Construction will be permitted to begin only after acceptance of the QA/QC Plan. The detailed requirements for this Plan are delineated in the following paragraphs. No payments will be made to the Contractor until the QA/QC Plan is fully accepted by the City DWM.

- C. The QA/QC Plan shall describe and define the personnel requirements described herein. The Contractor shall employ a full time on-site QA/QC Manager to manage, address and resolve all quality control issues.
1. The QA/QC Manager shall be as identified by the Contractor and approved by the City DWM. The QA/QC Manager shall have a minimum of five (5) years of construction experience in pipe line installation. The QA/QC Manager shall be onsite at all times while work is being performed by the contractor, to remedy and demonstrate that work is being performed properly and to make multiple observations of all Work in progress. This individual shall be dedicated solely to QA/QC activities and shall have no supervisory or managerial responsibility over the work force. The QA/QC Manager shall not be assigned any other duties or roles by the Contractor.
 2. The Contractor shall provide additional personnel who are assigned to assist the QA/QC Manager as required to fulfill the requirements of the QA/QC Plan. The Contractor shall provide a copy of the letter to the QA/QC Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the QA/QC Manager, including authority to stop work which is not in compliance with the contract. The QA/QC Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the City DWM.
- D. The Contractor's QA/QC program shall ensure the achievement of adequate quality throughout all applicable areas of the Project. A customized QA/QC Plan shall be developed that discusses each type of work that the Contractor is responsible for within the Project. The QA/QC Plan shall describe the program and include procedures, work instructions and records and a description of the quality control organization.
1. The description of the quality control organization shall include a chart showing lines of authority staffing plan and acknowledgment that the QA/QC staff shall implement the system for all aspects of the work specified. The staffing plan shall identify the name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QA/QC function including the QA/QC Manager.
 2. In addition, the Plan shall describe methods relating to areas that require special testing and procedures as noted in the specifications.
- E. Identification and Control of Items and Materials: Procedures to ensure that items or materials that have been accepted at the site are properly used and installed shall be described in the QA/QC Plan.

- F. The procedures shall provide for proper identification and storage, and prevent the use of incorrect or defective materials.
- G. Inspection and Tests: The Contractor shall have written procedures defining a program for control of inspections performed and these procedures shall be described in the QA/QC Plan.
1. Inspections and tests shall be performed and documented by qualified individuals. At a minimum, "qualified" shall mean having performed similar QA/QC functions on similar type projects for a minimum of five (5) years and possession of industry standards certification and license. Records of personnel experience, training and qualifications shall be submitted to the City DWM for review and approval.
 2. The Contractor shall maintain and provide to the City DWM, within two working days of completion of each inspection and test, adequate records of all such inspections and tests. Inspection and test results shall be documented and evaluated to ensure that requirements have been satisfied.
 3. Procedures shall include:
 - a. Specific instructions defining procedures for observing all Work in process and comparing this Work with the Contract requirements (organized by specification section).
 - b. Maintaining and providing daily QA/QC inspection reports. Such reports shall, at a minimum, include the following:
 - i. Dated list of Item(s) inspected
 - ii. Location of the test sample(s)
 - iii. Logs, detailed locational drawings and confirmation reports
 - iv. Quality characteristics in compliance
 - v. Quality characteristics not in compliance
 - vi. Corrective/remedial actions taken
 - vii. Statement of certification
 - viii. QC Manager's signature
 - c. Specific instructions for recording all observations and requirements for demonstrating through the reports that the Work observed was in compliance or a deficiency was noted and action to be taken.
 - d. Procedures to preclude the covering of deficient or rejected Work.
 - e. Procedures for halting or rejecting Work.
 - f. Procedures for resolution of differences between the QA/QC representative(s) and the production representative(s).
 - g. Method of documenting QA/QC process and results including:
 - i. Automatic exception reporting
 - ii. Resolution tracking
 - iii. Quality Confirmation Test reports
 - iv. Sample retention index and storage

4. The QA/QC Plan shall identify all contractual hold/inspection points as well as any Contractor imposed hold/inspections points.
 5. The QA/QC Plan shall include procedures to provide verification and control of all testing provided by the Contractor including:
 - a. Individual test records containing the following information:
 - i. Item tested –item number and description
 - ii. Test results
 - iii. Test designation
 - iv. Test work sheet including location sample was obtained
 - v. Acceptance or rejection
 - vi. Date sample was obtained
 - vii. Retest information, if applicable
 - viii. Control requirements
 - ix. Tester signature
 - x. Testing QC staff initials
 - b. Maintaining and providing to the City DWM daily testing records. Such records shall, at a minimum, contain the following:
 - i. Dated list of Item(s) inspected
 - ii. Location of the test sample(s)
 - iii. Logs, detailed location drawings and confirmation reports
 - iv. Quality characteristics in compliance
 - v. Quality characteristics not in compliance
 - vi. Corrective/remedial actions taken
 - vii. Statement of certification
 - c. QC Manager’s signature providing for location maps/drawings (i.e. lift drawings, laying schedules, etc.) for all tests performed or location of Work covered by the tests.
 - d. Maintaining copies of all test results.
 - e. Ensuring City DWM receives independent copy of all tests.
 - f. Ensuring testing lab(s) are functioning independently and in accordance with the specifications.
 - g. Ensuring re-tests are properly taken and documented.
- H. Control of Measuring and Test Equipment: Measuring and/or testing instruments shall be adequately maintained, calibrated, certified and adjusted to maintain accuracy within prescribed limits. Calibration shall be performed at specified periods against valid standards traceable to nationally recognized standards and documented.
- I. Supplier Quality Assurance: The QA/QC Plan shall include procedures to ensure that procured products and services conform to the requirements of the Specifications. Requirements of these procedures shall be applied, as appropriate, to subcontractors and suppliers. QA/QC inspections and certifications shall not be deferred to the Contractor’s subcontractors or suppliers.

J. Deficient, Defective and Non-conforming Work and Corrective Action

1. The QA/QC Plan shall include procedures for handling of deficiencies and non-conformances. Deficiencies and non-conformances are defined as documentation, drawings, material, and equipment or Work not conforming to the specified requirements or procedures. The procedures shall prevent non-conformances by identification, documentation, evaluation, separation, disposition and corrective action to prevent recurrence. Conditions having adverse effects on quality shall be promptly identified and reported to the senior level management. The cause of conditions adverse to quality shall be determined and documented and measures implemented to prevent recurrence. In addition, at a minimum, this procedure shall address:
 - a. Personnel responsible for identifying deficient and non-complying items within the work.
 - b. How and by whom deficient and non-compliant items are documented “in the field”.
 - c. The personnel and process utilized for logging deficient and non-compliant work at the end of each day onto a Deficiency Log.
 - d. Tracking processes and tracking documentation for Deficient and Non-Compliant items.
 - e. Personnel responsible for achieving resolution of outstanding deficiencies.
 - f. Once resolved, how are the resolutions documented and by whom.

K. Special Processes And Personnel Qualifications

1. The QA/QC Plan shall include detailed procedures for the performance and control of special process (e.g. welding, soldering, heat treating, cleaning, plating, nondestructive examination, etc.).
2. Personnel performing special process tasks shall have the experience, training and certifications commensurate with the scope, complexity, or nature of the activity. They shall be approved by the City DWM before the start of Work on the Project.

L. Audits

1. The Contractor’s QA/QC program shall provide for documented audits to verify that QA/QC procedures are being fully implemented by the Contractor as well as its subcontractors. Audit records shall be made available to the City DWM upon request.
2. The Contractor shall provide to the City DWM, a quarterly report indicating any outstanding and unresolved exceptions to the QA/QC program or contract documents. The report will include documentation on any standards modifications, corrections, failed tests and a review of field procedures and checks and balances effectiveness.

M. Documented Control/Quality Records

1. The Contractor shall establish methods for control of Contract that describe how documents are received and distributed to assure the correct issue of the document being used. The methods shall also describe how as-built data are documented and furnished to the City DWM.
2. The Contractor shall maintain evidence of activities affecting quality, including operating logs, records of inspections and tests, audit reports, material analyses, personnel qualification and certification records, procedures, and document review records.
3. Quality records shall be maintained in a manner that provides for timely retrieval, and traceability. Quality records shall be protected from deterioration, damage, and destruction. The Contractor shall maintain an automated exceptions list of any non-conforming or defective or substandard work.
4. The Contractor shall provide a list with specific records as specified in the Contract Documents which will be furnished to the City DWM at the completion of activities and in conjunction with logs and location drawings.

N. Acceptance of QA/QC Plan: The City DWM's review and acceptance of the Contractor's QA/QC Plan shall not relieve the Contractor from any of its obligations for the performance of the Work. The Contractor's QA/QC staffing is subject to the City DWM's review and continued acceptance. The City DWM, at its sole option, without cause, may direct the Contractor to remove and replace the QA/QC representative. No Work covered by the QA/QC Plan shall start until the City DWM's acceptance of Contractor's QA/QC plan has been obtained.

O. The City DWM may perform independent quality assurance audits to verify that actions specified in Contractor's QA/QC Plan have been implemented. No City DWM audit finding or report shall in any way relieve Contractor from any requirements of this Contract.

1.07 TESTING SERVICES

A. All tests which require the services of a laboratory to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to City DWM. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards. All standard quality assurance testing and installation verification testing will be at the expense of the Contractor.

- B. Testing, when required, will be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).
- C. The City DWM shall have the right to inspect work performed by the independent testing laboratory both at the project and at the laboratory. This shall include inspection of the manual, equipment calibrations, proficiency sample performance, etc.).
- D. Testing services provided by the City DWM, if any, are for the sole benefit of the City DWM; however, test results shall be available to the Contractor. Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.
- E. Testing Services Provided by the Contractor
 - 1. Unless otherwise specified, and in conjunction with, all other specified testing requirements, the Contractor shall provide the following testing services, and submit a detailed testing plan for each along with proposed forms for City DWM's review.
 - 2. Moisture-density and relative density tests on embankment, fill, and backfill materials.
 - 3. In-place field density test on embankments, fills and backfill.
 - 4. QC testing of all precast and/or pre-stressed concrete
 - 5. All other tests and engineering data required for the City DWM's review of materials and equipment proposed to be used in the Work
 - 6. In addition, the following QC tests shall be performed by the Contractor:
 - a. Holiday testing of pipeline and all other coatings systems applied to surfaces as required by the City DWM.
 - b. Slumps, air bucket tests, compression tests and other confirmation tests.
 - c. Air testing of field-welded joints for steel pipe or pipe cylinders and fabricated specials.
 - d. All testing and inspection of welding work including, but not limited to, welding procedure qualifications, welder operator qualifications, all work performed by the certified welding inspector, all appropriate nondestructive testing of welds and all repair and retest of weld defects.
 - 7. Testing, including sampling, shall be performed by the Contractor's testing firm's laboratory personnel, in the manner and frequency indicated in the Specifications. The City DWM shall have the right to stipulate the location of the confirmation tests. The Contractor shall provide preliminary representative samples of materials to be tested, to the testing firm's laboratory, in required quantities.

8. The testing firm's laboratory shall perform all laboratory tests within a reasonable time consistent with the specified standards and will furnish a written report of each test.
9. Where such inspection and testing are to be conducted by an independent laboratory agency, the sample or samples shall be selected by such laboratory or agency or the City DWM and shipped to the laboratory by the Contractor at Contractor's expense.
10. Notify laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.

F. Transmittal of Test Reports:

1. Written reports of tests and engineering data furnished by Contractor for City DWM's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings. Final transmittal of all Project testing records will be required as a final close-out submittal for the release of retainage.
2. Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in progress of the Work.

+++ END OF SECTION 01400 +++

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes testing which the City DWM may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.
- B. This section also includes all testing required by the City DWM to verify if work performed by the Contractor is in accordance with the requirements of these specifications, i.e., concrete strength and slump testing, soil compaction, etc.
- C. This section does not include testing required in various sections of these specifications to be performed by the manufacturer, i.e., testing of pipe. Where no testing requirements are described in various sections of these specifications, but the City DWM decides that testing is required to demonstrate compliance with material or performance standards, the City DWM may require testing to be performed under current pertinent standards for testing.
- D. An independent testing laboratory shall be selected by the Contractor to complete the testing. The laboratory must be approved in writing by the City DWM before any testing services are performed.
- E. The Contractor shall pay directly for the services of the independent testing laboratory for all testing required under this Contract.
- F. Employment of the testing laboratory shall in no way relieve the Contractor of Contractor's obligation to perform work meeting the requirements of the Contract.
- G. Testing laboratory services will be required for, but not be limited to:
 - 1. Cement
 - 2. Aggregate
 - 3. Concrete
 - 4. Steel and Metals
 - 5. Welding
 - 6. Backfill and Compaction

7. Bituminous Pavement

1.02 LABORATORY DUTIES

- A. Cooperate with the City DWM and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.
 - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 - 2. Ascertain compliance with requirements of the Contract Documents.
- D. Promptly notify the City DWM and Contractor of irregularity or deficiency of work which are observed during performance of services.
- E. Promptly submit copies of report of inspections to the City DWM with the following information included:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name and address
 - 4. Name and signature of inspector
 - 5. Date of inspection or sampling
 - 6. Record of temperature and weather
 - 7. Date of test
 - 8. Identification of product and Specification section
 - 9. Location of sample or test in the Project
 - 10. Type of inspection or test
 - 11. Results of test and observations regarding compliance with the Contract Documents
 - 12. Interpretation of test results, when requested by the Contractor
- F. Perform additional services as required.

- G. The laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of the Contract Documents
 - 2. Approve or accept any portion of the Work
 - 3. Perform any duties of the Contractor.

1.03 CONTRACTOR RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to Work and/or manufacturer's requirements.
- B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.
- D. Furnish required labor and facilities to:
 - 1. Provide access to Work to be tested;
 - 2. Obtain and handle samples at the site;
 - 3. Facilitate inspections and tests;
 - 4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.
- E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency and shipped to the laboratory by the Contractor at Contractor's expense.
- G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the City DWM.

1.04 QUALITY ASSURANCE

Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.05 PRODUCT HANDLING

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work.

1.06 FURNISHING MATERIALS

The Contractor shall be responsible for furnishing all materials necessary for testing.

1.07 CODE COMPLIANCE TESTING

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.08 CONTRACTOR'S CONVENIENCE TESTING

Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.09 SCHEDULES FOR TESTING

A. Establishing Schedule

1. The Contractor shall, by advance discussion with the testing laboratory selected by the City DWM, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.
2. Provide all required time within the construction schedule.

B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be back charged to the Contractor and shall not be borne by the City DWM.

1.10 TAKING SPECIMENS

Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory.

1.11 TRANSPORTING SAMPLES

The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 TESTS AND CERTIFICATIONS

- A. As a minimum, the following tests shall be performed and the following certification provided:
 - 1. Cement: Certified test results by cement manufacture or by independent laboratory shall be furnished as required by the City DWM.
 - 2. Aggregate and Mortar Sand: Certified test results by aggregate producer or by independent laboratory shall be furnished as required by the City DWM.
 - 3. Concrete:
 - a. Certified test results of all concrete in accordance with ASTM C31, C39 and C172.
 - b. Slump tests:
 - (1) Perform slump tests on the job in accordance with ASTM standards.
 - (2) One (1) slump test shall be performed for each 25 cubic yards of concrete.
- B. Steel and Miscellaneous Metal: Reinforcing steel, structural steel and miscellaneous metal may be inspected visually on site by the City DWM.
- C. Welding: 1 percent of all structural welds during construction shall be inspected either visually or by an independent laboratory as required by the City DWM.
- D. Laboratory tests of compacted backfill shall be made in accordance with ASTM D698. In-place density tests shall be made in accordance with ASTM D1556 or D2922. Compaction testing shall be required as specified in paragraph 3.16 of Section 02225.
- E. Bituminous Concrete Pavement: Material testing for bituminous concrete shall be performed as directed by the City DWM. Refer to paragraph 3.11 of Section 02700.

+++ END OF SECTION 01410 +++

**SECTION 01500
FIELD OFFICES AND SHEDS**

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Contractor shall provide all field offices and sheds as necessary for completion of the Work as specified herein
- B. The Contractor shall maintain offices and sheds in proper and safe condition through the progress of the Work. In the event of loss or damage, the Contractor shall immediately make all repairs and replacements necessary subject to approval of the City DWM and at no additional cost to City DWM. At completion of the Work, the Contractor shall remove all offices and sheds as directed by the City DWM.
- C. The ownership of the trailers for City DWM's facilities shall remain with the Contractor. All office furnishings and equipment provided by Contractor under this section of specifications shall remain as City DWM property. At completion of the Work, the Contractor move all office furnishings and equipment to a location designated by the City DWM.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract.
- B. City DWM's Field Office: Submit a plan of the office layout to City DWM for mark-up and approval within 10 days after the Notice to Proceed.
- C. Telephone System: Schematic drawings, showing the complete telephone system to be installed shall be provided for review by the City DWM before installation of the service.

1.03 REQUIREMENTS

- A. General
 - 1. The materials, equipment, and furnishings provided under this Section shall be new and shall meet all the applicable codes and regulations.
 - 2. Make all provisions, and pay all costs of furnishing, installation, maintenance, professional services, permit fees, and site work for the temporary facilities.
- B. Construction
 - 1. Temporary buildings shall be structurally sound, weather tight, with floors raised above ground. All mobile/modular buildings shall comply with GA-DCA/SBCC/ADA requirements and shall be Williams-Scottsman or equal.

2. Temporary buildings shall have temperature transmission resistance compatible with occupancy and storage requirements.

PART 2 PRODUCTS

2.01 CONTRACTOR'S FACILITIES

- A. Contractor's Plant: Contractor's plant, for purposes of this Section, is defined to include but not limited to Contractor's field offices, first aid station, storage facilities, shops, and major equipment. Sufficient construction plant shall be provided and maintained at all points where work is in progress to meet adequately demands of the Work and with ample margin for emergencies or overload.
- B. The plant shall be of sufficient capacity and reliability to permit a rate of progress, which will insure completion of the Work within the time stipulated in the Contract. Insufficient, inadequate and improper plant or equipment shall be brought to acceptable condition or shall be removed from the site.
- C. The location of stationary and mobile equipment shall be subject to the City DWM's approval.
- D. First Aid Station: Contractor shall provide a suitable first aid station at the work site. The station shall be equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. The information reflecting this arrangement shall be clearly posted for easy visibility. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the City DWM's and City DWM consultant's personnel.

2.02 CITY DWM'S FACILITIES

- A. General
 1. The Contractor shall be responsible for all office setup and removal costs, furnishing and installing all furniture and equipment as specified herein, and all maintenance costs for the City DWM's field office. The facilities for the field staff shall be in place within 30 days following issuance of the Notice to Proceed.
 2. All facilities and equipment listed below are to be provided as specified for exclusive use by the City DWM's project staff during the entire duration of the contract plus six additional months after completion of all punch list items or total project closeout whichever occurs last. The Contractor shall maintain ownership of the office trailer, but all office furniture, equipment and supplies and computer systems and hardware supplied by the Contractor shall remain in the possession of the City DWM of Atlanta after closeout of the project.

B. City DWM's Field Office

1. The Contractor shall furnish one new double wide trailer to serve as the City DWM's field office for the City DWM's field staff. The interior of the trailer shall be divided by partitions with doors and have a minimum of two offices, conference room, men's restroom, women's restroom, communications equipment closet, break area, janitor's closet and storage closet. The floor plan shall be submitted to the City DWM for approval as specified in Paragraph 1.02B of this Section. The final dimensions and number of rooms/areas shall be as directed by the City DWM.
2. The field office shall have a minimum of two exterior entrances with solid core doors with deadbolts. The trailer shall be furnished with a white, fiberglass shingle, 20-year warranty roof, color coordinated plastic or PVC skirting with access door and porch with landing, steps and full aluminum canopy at each exterior door. Porch shall be 8-foot wide by 6-foot deep, minimum. Aluminum canopy shall be as manufactured by Ray-O-Lite South East, Inc. or equal.
3. The field office shall be equipped with approximately, 1-foot wide, perforated aluminum soffits on all four sides and continuous ridge vent.
4. The City DWM will indicate the locations of telephone/computer outlets and certain electrical outlets on the shop drawing. However, there shall be a minimum of one combination telephone/computer outlet per office and two combination telephone/computer outlets in the conference room. All combination telephone/computer outlets shall be wired to the communications equipment closet.
5. Electrical outlets shall be no more than 6 feet apart, with a minimum two outlets per wall. All outlets shall be surge protected. Provide four duplex surge protected outlets at 42-inches above finished floor (AFF) in the communications equipment closet.
6. All walls shall be vinyl covered sheetrock. All exterior and all interior walls shall be fully insulated.
7. Floors shall be double 3/4-inch CDX plywood minimum with vinyl tile floor covering and color coordinated vinyl base cove throughout.
8. Provide a minimum of twelve 48-inch by 30-inch minimum sliding, lockable, double pane insulated windows with insect screens and metal mini-blinds.
9. Provide 4-foot fluorescent lighting fixtures with diffuser covers to provide 100-foot candles of illumination for all areas. Provide 18-inch fluorescent lighting fixture in bathrooms.
10. Each restroom shall be furnished with:

- a. An elongated ceramic commode.
 - b. Ceramic sink with faucets
 - c. Vinyl coated wire shelf for supplies, 12-inches deep by 24-inches wide, minimum.
 - d. Medicine cabinet with mirror doors.
 - e. Paper towel dispenser.
 - f. Toilet paper holder.
 - g. Liquid soap dispenser.
11. Break area shall be furnished with:
- a. Wall cabinets with shelves
 - b. Laminated counter with stainless steel sink and faucet
 - c. Base cabinet with shelves
12. Provide 40-gallon hot water heater (to serve both restrooms and break area).
13. Exterior doors shall be insulated heavy-duty steel with pneumatic/hydraulic closures and Best lock sets and double cylinder deadbolts. Locksets on all interior doors except restrooms shall be keyed privacy type, Kwikset, or equal.
14. Interior doors shall be pre-hung stained solid core wood with wood trim and shall be furnished with integral locks. Provide chrome coat hook on the back of all interior doors.
15. Sound attenuation/insulation in all interior walls shall be required.
16. Communication equipment closet with door shall have painted plywood walls. Provide up to 24 J-boxes with conduit stubbed to under trailer for use in communications installation. Provide stainless steel switch plates and outlet covers. Include master circuit surge protector. Lights and receptacles shall be on separate circuits. Provide 10 dedicated circuits for computers, copiers, etc. and emergency lights and lighted exit signs.
17. Provide a 10-pound Type A-B-C fire extinguisher at each exit and in break area.
18. Provide a high-pressure sodium photocell controlled light at each exterior entrance.
19. Provide freeze protection for all water system piping.
20. Provide a HVAC system. HVAC system shall include:
- a. Dual heat pump units.
 - b. In duct heat strips as required; piped condensate drains to eliminate surface evaporation, including dry well if needed; single programmable thermostat to

control both units simultaneously; accessible filter locations; individual returns and supplies for all rooms and spaces including hallways.

- c. Locate units at center of each side of trailer for optimum and equal air distribution.
- d. Two vertical chases to be s located on interior walls, behind doors.
- e. HEPA air filtration system including manufacturer's recommended maintenance instructions.

21. Furnish and install the following office furniture:

- a. Desks, 36-inches by 60-inches, double pedestal with mahogany colored laminated top
- b. Credenzas, mahogany colored laminate, with knee-hole and keyboard drawer.
- c. Hutch, mahogany colored laminate.
- d. Conference table, 48-inches by 168-inches with mahogany colored laminated top.
- e. Swivel chairs with black frame.
- f. Guest chairs with black frame.
- g. Work tables, 30-inches x 60-inches with mahogany colored laminated tops.
- h. 4-drawer, legal size locking fireproof file cabinets.
- i. 36-inches x 72-inches bookcases.
- j. 48-inch x 96-inch marker board with aluminum frame, installed in conference room.
- k. 24-inch by 36-inch marker board with aluminum frames, installed.
- l. 24-inch by 36-inch gray fabric covered bulletin board, installed.
- m. Plastic trash receptacles

22. Furnish and install a water filtration system as provided by a standard coffee service for the duration of the Contract. In addition furnish the following:

- a. One drinking water appliance (to include plastic cups and dispenser and bottled water supply) or bottled water for the duration of the Contract.
- b. One 12-cup commercial metal coffee maker with two decanters, filters, 12-ounce Styrofoam cups, stirrers and supplies, including regular coffee, decaffeinated coffee, tea bags, sugar, nondairy creamer and artificial sweetener for the duration of the Contract.

23. Furnish and install the following office equipment and supplies:

- a. One plain paper color facsimile machine with automatic document feed and automatic single sided faxing.
- b. One plain paper copier machine, (City DWM's choice) with automatic document feeder, multi sheet and single sheet feeder, 8-1/2 x 11 to 11 x 17; zoom reduction/enlargement in 1 percent increments; 3 paper supply trays with 250 sheet capacity each (8-1/2 x 11, 8-1/2 x 14 and 11 x 17); and with a finisher with multi-position stapling and optional hole punching.

- c. The Contractor shall provide a maintenance service contract and copy paper, toner/ink cartridges, etc., for both machines during the Contract period.
24. Provide computer system hardware, software and local area network as follows:
- a. Furnish and install Dell Latitude Laptop Computer Systems, each equipped as follows:
 - i. 15.6-inch HD Screen
 - ii. 6GB SDRAM and 750GB, 7200 rpm Hard Drive
 - iii. 8X DVD +/- RW w/Roxio and Cyberlink Power DVD
 - iv. Optical USB mouse.
 - v. Docking Station with 20-inch Wide Screen Flat Panel Monitor and Dell USB Keyboard
 - vi. 9 cell Lithium Battery
 - vii. Integrated Ethernet Network Card
 - viii. Nylon Zippered Carrying Case with Hand Grips and Shoulder Strap
 - ix. Color Laser Printer
 - b. Maintenance service agreements for all hardware for duration of contract.
 - c. Computer Software, Latest Versions, for each computer system. (Note: This software shall be supplied in addition to the software specified in Specification 01350, Project Document Tracking and Control System);
 - i. Microsoft Windows 7, Professional Edition.
 - ii. Microsoft Office, Professional Edition (w/Adobe Acrobat).
 - iii. McAfee Anti-Virus
 - iv. Provide 200 blank CD-Rs
 - v. Provide 50 blank DVD-Rs
 - d. Local Area Network: Furnish and install cable, terminations and connectors to connect the computer system Ethernet cards, the printer Ethernet cards and copiers and facsimile machine as a local area network. Cable shall be installed inside the walls or under the floor. Furnish the services of a qualified field technician to set up the software as a local area network as directed by the City DWM.

2.03 TELEPHONE SYSTEM

- A. Provide telephone system as follows, complete for the duration of the project, plus six additional months:
 - 1. Make all necessary arrangements for outside telephone service to Contractor's office and City DWM's field office. The connection to City DWM's Facilities shall be consistent with the specified hardware requirements for such facilities
 - 2. Provide Computerized Modular Telephone System: Telephone system shall be comprised of Cisco IP Phones, Series 7962G. Each phone shall be equipped with, but not be limited to, the following features:
 - a. Capability to support up to 6 lines

- b. Voicemail; call on hold; hold reminder tone; call forwarding; conference calling; intercom call-ring/voice signal; last number redial; on-hook, headset and speakerphone dialing; speed dialing; ringing line preferences; call transfer, volume and mute control; incoming call rollover.
3. Telephone system shall be installed complete including UPS backup.
4. Wall outlet jacks for the telephone system shall be provided. The system shall not be hard wired.
5. Provide one central line for office and a separate line for fax use.
6. All costs for purchase and installation of hardware, lines, line extensions, service changes and recurring monthly charges for telephone service shall be paid by the Contractor.
7. The City DWM shall reimburse the Contractor for long distance charges made by the City DWM.

2.04 SECURITY SYSTEM

- A. During other than normal daytime office working hours provide a totally separate electronic security system monitored by a security agency for the City DWM's facilities. All offices shall be equipped with exterior security flood lights automatically activated by darkness and in sufficient number and placement to provide adequate lighting of the office and the parking areas
- B. Arrange for installation and provide security system for City DWM's field office during construction. Pay for purchase and installation and all monthly charges.

2.05 TEMPORARY UTILITIES

- A. Determine the need for temporary utility services, including utility services for City DWM's facilities and first aid stations, and make all arrangements with utility companies and governmental agencies to secure such services. Such services shall be provided at no additional cost to the City DWM. Temporary utility services shall be furnished, installed, connected, and maintained by Contractor in a manner satisfactory to the City DWM, and shall be removed in like manner prior to final acceptance.
- B. Power
 1. The Contractor shall determine the type and capacity required and shall make the necessary arrangements for obtaining temporary power metering equipment, pay for all installation costs and usage costs.
 2. All temporary electric power installations shall meet the safety requirements of all federal, state, and local codes and regulations.

3. Cost of electric power used in testing will be borne by the Contractor.
- C. Lighting: Provide temporary site lighting to meet all applicable safety requirements to allow erection, application or installation of materials and equipment, and observation or inspection of the Work.
- D. Heating, Cooling, and Ventilating
1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials, equipment, and finishes from damage due to temperature or humidity. Costs for temporary heat shall be borne by the Contractor.
 2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
 3. Pay all costs of installation, maintenance, operation, removal, and fuel consumed.
 4. Provide portable unit heaters, complete with controls, oil or gas-fired, and vented to the outside as required for protection of health and property.
 5. If permanent natural gas piping is used for temporary heating units, do not modify or reroute gas piping without approval of utility company. Provide separate gas metering as required by utility.
- E. Water
1. The Contractor shall be allowed to connect to the existing City DWM water system at a point approved by the City DWM. The connection point shall serve as a source for water for construction purposes. The Contractor shall provide temporary facilities and piping required to bring water to the point of use at each site, and remove them when no longer needed.
 2. Refer to Section 01040 for requirements related to utilization of water for construction purposes.
- F. Sanitary and Personnel Facilities
1. Provide and maintain facilities for Contractor's employees, Subcontractors, and all other onsite employer's employees. Service, clean, and maintain facilities and enclosures.
 2. Use of City DWM's existing sanitary facilities by construction personnel will not be allowed.
- G. Fire Protection: Furnish and maintain on the site adequate firefighting equipment capable

of extinguishing incipient fires. Comply with applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).

2.06 PARKING FACILITIES

Provide parking adjacent to City DWM's field office for a minimum of 5 cars. The parking surface shall be promptly and adequately maintained by the Contractor for the duration of the Contract.

PART 3 EXECUTION

3.01 PREPARATION

Fill and grade sites for temporary structures to provide surface drainage.

3.02 INSTALLATION

- A. Locate offices at locations designated by the City DWM.
- B. Construct temporary field offices, first aid stations, and storage facilities on proper foundations and provide connections for utility all services.
 - a. Secure portable or mobile buildings when used.
 - b. Provide tie-downs for 100 mile per hour gusts and winds
- C. Mount thermometer at convenient outside location, not in direct sunlight.
- D. Mount rain gauge in accessible open area.

3.03 MAINTENANCE AND CLEANING

- A. Repair and clean the offices, parking areas and access routes and provide complete professional janitorial services in the City DWM's facilities for the duration of the project. Cleaning shall be done on a daily basis, to the satisfaction of the City DWM, during other than normal daytime office working hours. These daily services shall include sweeping, vacuuming, dusting, emptying of trash, cleaning of washbasins, bathroom facilities and mopping of all vinyl floors.
- B. Provide containers for collection and disposal of waste materials, debris and rubbish. Dispose of such waste materials, debris, and rubbish offsite. Trash containers shall be lined with trash bags.
- C. Contractor shall provide for monthly waxing of all vinyl floors.
- D. Contractor shall provide for monthly exterminating services of the offices.

- E. The Contractor shall provide floor mats at exterior entrances (inside and outside of door) and all cleaning supplies, toilet tissue and paper towels, liquid soap, air fresheners, etc.

3.04 REMOVAL

- A. Remove temporary field offices, contents, temporary utilities and services at a time when no longer needed. The office contents shall be packed and moved by the Contractor to a location designated by the City DWM.
- B. Remove foundations and debris; grade site to required elevations; clean and restore areas as specified in Section 02920.

+++ END OF SECTION 01500 +++

SECTION 01510
TEMPORARY FACILITIES

PART 1 GENERAL

1.01 SCOPE

- A. Temporary facilities required for this work include, but are not necessarily limited to:
 - 1. Temporary utilities such as water and electricity.
 - 2. Sanitary facilities.
 - 3. Potable water.
 - 4. Temporary heat and ventilation.
 - 5. Parking facilities

1.02 GENERAL

- A. Installation: Furnish and install temporary facilities as required for the performance of the Work.
- B. Maintenance: Maintain temporary facilities in proper and safe condition throughout progress of the Work. In the event of loss or damage, immediately make all repairs and replacements necessary, at no additional cost to the City DWM.
- C. Removal: Remove temporary facilities as rapidly as progress of the Work will permit. Clean and repair damage caused by temporary installations or use of temporary facilities.

1.03 TEMPORARY UTILITIES

- A. General:
 - 1. Pay all costs for temporary utilities until Project completion.
 - 2. Costs for temporary utilities shall include all power for testing equipment.
- B. Temporary Water:
 - 1. Refer to Section 01040 for requirements related to utilization of water for construction purposes.

2. Provide all necessary temporary piping, and upon completion of the Work, remove all temporary piping and water meters.

C. Temporary Electricity:

1. Provide all necessary wiring for the Contractor's use.
2. Furnish, locate and install area distribution boxes such that the individual trades may use their own construction type extension cords to obtain adequate power and artificial lighting at all points where required and for safety.

1.04 SANITARY FACILITIES

Prior to starting the Work, the Contractor shall furnish, for use of Contractor's personnel on the job, all necessary toilet facilities which shall be secluded from public observation. Toilet facilities shall be either chemical toilets or shall be connected to the City DWM's sanitary sewer system. All facilities, regardless of type, shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the Work is performed. Adequacy of these facilities will be subject to the City DWM's review and maintenance of facilities must be satisfactory to the City DWM at all times.

1.05 POTABLE WATER

The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the City DWM who are associated with the Work.

1.06 TEMPORARY HEAT AND VENTILATION

Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the work, to meet specified minimum conditions for the installation of materials and to protect materials and finishes from damage due to temperature or humidity.

1.07 PARKING FACILITIES

Parking facilities for the Contractor's and Contractor's subcontractors' personnel shall be the Contractor's responsibility.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

(NOT USED)

+++ END OF SECTION 01510 +++

**SECTION 01540
SECURITY AND SAFETY**

PART 1 GENERAL

1.01 SECURITY PROGRAM

- A. The Contractor shall protect the Work, including all field offices and temporary facilities and their contents from theft, vandalism and unauthorized entry.
- B. The Contractor shall initiate a site security program at the time of mobilization onto the worksite, which provides adequate security for site stored and installed material.
- C. The Contractor shall maintain the security program throughout the Contract duration.
- D. The Contractor shall be wholly responsible for the security of their storage and lay down areas and for all their plant, material, equipment and tools at all times.
- E. The Contractor shall provide the City DWM with a list of 24 hour emergency phone numbers including chain of command.

1.02 ENTRY CONTROL

- A. The Contractor shall restrict entry of unauthorized personnel and vehicles onto the Project site.
- B. The Contractor shall allow entry only to authorized persons with proper identification.
- C. The Contractor shall maintain an Employee Log and Visitor Log and make the log available to the City DWM upon request. The log shall be submitted to the City DWM bi-weekly or as necessary. Sample logs are included at the end of this section.
- D. The Contractor shall require all visitors to sign the Visitor Acknowledgment of the Program Site Rules/Visitor Log, which includes a release form. Copies of these forms shall be submitted to the City DWM bi-weekly and maintained in the Contractor's security files on-site.
- E. The Contractor shall require all employees to sign the Employee Acknowledgment of Project Site Rules Log included at the end of this Section. All employees, subcontractor employees and lower tier contractor employees will receive a new employee orientation. Signing the Employee Log by the employee is certifying that the orientation training has been received.

- F. The Contractor and City DWM have the right to refuse access to the site or request that a person or vehicle be removed from the site if found violating any of the Project safety, security conduct rules.

1.03 BARRICADES, LIGHTS AND SIGNALS

- A. The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction.
- B. The Contractor will be held responsible for all damage to the work and any resulting injuries due to failure of barricades, signs and lights and whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at Contractor's cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the Project has been accepted by the City DWM.

1.04 RESTRICTIONS

The Contractor shall not allow cameras on site or photographs taken except with approval of the City DWM.

1.05 CONTRACTOR SAFETY/HEALTH AND SECURITY PLAN

- A. Prior to the performance of any work the Contractor will prepare a contract specific Safety/Health and Security Plan signed by an officer of the Contractor's organization. Adequacy of the plan shall be the responsibility of the Contractor.
- B. The City DWM will not review the Contractor's safety plan for the adequacy of the plan. The plan shall:
 - 1. Identify the person(s) responsible for implementation and enforcement of Safety/Health and Security rules and regulations for this Project.
 - 2. Generally address safe work procedures for the activities within the Contractor's scope of work.
 - 3. Included a new employee orientation program, which addresses job and site specific rules, regulations and hazards.
 - 4. Include the Contractor's Drug Free Work Place Policy including substance abuse prevention and testing program.

5. Include provisions to protect all of the Contractor's employees, other persons and organizations who may be affected by the work from injury, damage or loss.
 6. Comply with current Fed/OSHA, Safety/Health and Security Plan, facility safety program (when applicable), and locally accepted safety codes, regulations and practices.
 7. Include a site specific emergency action and evacuation plan.
 8. Include Hazard Communication/Right To Know Program.
 9. Include security procedures for the Contractor's work, tools, and equipment.
 10. Include the capability of providing the City DWM with documentation to show compliance with their plan, plus accidents and investigation reports.
 11. Address any other specific contract requirements.
- C. Provide a Job Safety Analysis (JSA) for the scope of work, prior to the start of work.
- D. Review of the Contractor's Safety Plan by the City DWM shall not impose any duty or responsibility upon the City DWM for the Contractor's performance of the work in a safe manner.
- E. The Contractor shall be fully responsible for the safety and health of its employees, its subcontractors and lower tier contractors during performance of its work.
- F. The Contractor shall provide the City DWM with all safety reports, training records, competent person list, and accident reports prepared in compliance with Fed/OSHA and the Project Safety/Health and Security Plan.

1.06 PROJECT SAFETY COORDINATOR

- A. The Contractor shall be responsible for the safety of the Contractor's and the City DWM's personnel and all other personnel at the site of the Work. The Contractor shall have a Project Safety Coordinator on the job site. The Project Safety Coordinator shall maintain and keep available safety records and up-to-date copies of all pertinent safety rules and regulations.
- B. The Project Safety Coordinator shall:
1. Ensure compliance with all applicable health and safety requirements of all governing legislation.
 2. Schedule and conduct safety meetings and safety training programs as required by law for all personnel engaged in the work.

3. Post all appropriate notices regarding safety and health regulations at locations that afford maximum exposure to all personnel at the job site.
4. Post the name, address and hours of the nearest medical doctor; names and addresses of nearby clinics and hospitals; and the telephone numbers of the fire and police departments.
5. Post appropriate instructions and warning signs with regard to all hazardous areas or conditions.
6. Have proper safety and rescue equipment adequately maintained and readily available for any contingency. This equipment shall include such applicable items as: proper fire extinguishers, first aid kits, safety ropes and harnesses, stretcher, life savers, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, explosion meters, and any other equipment mandated by law.
7. Make inspections at least once daily in accordance with an inspection checklist report form to ensure that all machines, tools and equipment are in safe operating condition; that all work methods are not dangerous; and that all work methods are free of hazards.
8. Submit to the City DWM upon request copies of all inspection checklist report forms, safety records and all safety inspection reports and certifications from regulating agencies and insurance companies.
9. Notify the City DWM of a serious accident immediately, followed by a detailed written report within twenty-four (24) hours. A “serious accident” is defined as an accident requiring an absence from work of more than 2 days and/or hospitalization.
10. Notify the City DWM immediately in the event of a fatal accident.
11. Notify City DWM of any accident claim against the Contractor or any sub-contractor immediately, followed up by a detailed written report on the claim and its resolution.
12. Review safety aspects of the Contractor’s submittals as applicable.

VISITOR ACKNOWLEDGMENT OF THE PROJECT SITE RULES

By signing this Visitor's Log, I acknowledge that I understand and agree to abide by the project rules outlined below.

In consideration of my receipt of a visitor's pass as issued by the City DWM directly or indirectly for the City DWM, I waive on behalf of myself, my heirs, employer, legal representatives and assigns and hereby release and discharge the City DWM, and their subcontractors and consultants and each of their directors, officers, employees, representatives and agents from any and all claims, actions, causes of action or any charge of any kind whatsoever which may arise or could arise in the future as a result of my being present at the facility including injury, death or property damage whether or not caused by the fault or negligence of any of the parties released hereunder.

I further acknowledge that I have been briefed on specific hazards, hazardous substances that are on site and the site emergency action procedure.

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of City DWM's property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing City DWM's property
- Failure to use sanitary facilities
- Failure to report accidents or job related injuries
- Being under the apparent influence of drugs, alcohol or other intoxicants or in possession of drugs, alcohol or other intoxicants on the property
- Wearing shorts or tennis shoes on the jobsite
- Failure to wear a hardhat/safety glasses.
- Gambling at any time on the project
- Fighting, threatening behavior, or engaging in horseplay on the project
- Smoking in unauthorized areas on the project
- Open fire cooking or making unauthorized fires on project property
- Selling items or raffles without authorization
- Use of unauthorized cameras on the project
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area
- Failure to wear designated identification [Site Specific]
- Failure to use designated gates

I have read, understand and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

VISITOR LOG

THE SIGNING OF THIS LOG ACKNOWLEDGES I HAVE READ AND UNDERSTAND AND AGREE TO ABIDE BE THE PROJECT RULES OUTLINE ABOVE. THIS IS NOT A VEHICLE ACCESS PERMIT.

VISITOR'S NAME PRINT	SIGNATURE	COMPANY VISITED	DATE	IN	OUT

EMPLOYEE ACKNOWLEDGMENT OF THE PROJECT SITE RULES

By signing this Employee Log, I acknowledge that I understand and agree to abide by the project rules outlined below.

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of City DWM's property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing City DWM's property
- Failure to use sanitary facilities
- Failure to report accidents or job related injuries
- Under the apparent influence of drugs, alcohol or other intoxicants or in possession of drugs, alcohol or other intoxicants on the property
- Wearing shorts or tennis shoes on the jobsite
- Failure to wear a hardhat
- Gambling at any time on the project
- Fighting, threatening behavior, or engaging in horseplay on the project
- Smoking in unauthorized areas on the project
- Open fire cooking or making unauthorized fires on project property
- Selling items or raffles without authorization
- Use of unauthorized cameras on the project
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area
- Failure to wear designated identification [Site Specific]
- Failure to use designated gates

I have read, understand and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

EMPLOYEE LOG

BY SIGNING THIS LOG ACKNOWLEDGMENT I HAVE READ AND UNDERSTAND AND AGREE TO ABIDE BY THE PROJECT RULES OUTLINED ABOVE AND ALLSTATE, FEDERAL, LOCAL OR ANY OTHER CONTRACT OBLIGATIONS THAT MAY APPLY. I FURTHER ACKNOWLEDGE THAT I HAVE BEEN ORIENTATED AS TO THE SITE SPECIFIC HAZARDS, ANY HAZARDOUS SUBSTANCES I MAY BE EXPOSED TO WHILE ON THE SITE AND THE SITE/COMPANY EMERGENCY ACTION PROCEDURES, BY A REPRESENTATIVE OF THE COMPANY.

EMPLOYEE NAME (PRINT)	SIGNATURE	COMPANY NAME	DATE

+++ END OF SECTION 01540 +++

**SECTION 01550
TRAFFIC REGULATION**

PART 1 GENERAL

1.01 SCOPE

The work specified in this section includes the provision of products, permits, services, procedures and personnel by the Contractor to effect traffic control during the Work.

1.02 TRAFFIC CONTROL MANAGER

- A. The Contractor shall designate a qualified individual as the Traffic Control Manager (TCM) who shall be responsible for selecting, installing and maintaining all traffic control devices in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).
- B. A written resume documenting the experience and credentials of the TCM shall be submitted and accepted by the City DWM prior to beginning any work that involves traffic control.
- C. The TCM shall be available on a twenty-four (24) hour basis to perform his duties. If the work requires traffic control activities to be performed during the daylight and nighttime hours it may be necessary for the Contractor to designate alternate TCMs. An alternate TCM must meet the same requirements and qualifications as the primary TCM and be accepted by the City DWM prior to beginning any traffic control duties.
- D. The Traffic Control Manager's traffic control responsibilities shall have priority over all other assigned duties.
- E. As the representative of the Contractor, the TCM shall have full authority to act on behalf of the Contractor in administering the Traffic Control Plan. The TCM shall have appropriate training in safe traffic control practices in accordance with Part VI of the MUTCD. In addition to the TCM all other individuals making decisions regarding traffic control shall meet the training requirements of the Part VI of the MUTCD.
- F. The TCMs shall supervise the initial installation of traffic control devices. The City DWM prior to the beginning of construction will review the initial installation. Modifications to traffic control devices as required by sequence of operations or staged construction shall be reviewed by the TCMs.

PART 2 PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

- A. The Contractor shall provide post-mounted and wall-mounted traffic control and informational signs as specified and required by local jurisdictions.
- B. The Contractor shall provide automatic traffic control signals as approved by local jurisdictions.
- C. The Contractor shall provide traffic cones, drums and flashing lights as approved by local jurisdictions.
- D. The Contractor shall provide City of Atlanta police officers and certified flaggers and flagger's equipment as required by GDOT.

PART 3 EXECUTION

3.01 PERMITS

- A. The Contractor shall obtain permits from authorities having jurisdiction over road closures before closing any road. The Contractor shall use forms provided by authorities having jurisdiction (City of Atlanta Division of Traffic and Transportation, GDOT, etc.). Refer to Section 01060.
- B. Permit applications shall indicate the time (in days), length (in feet), the number of lanes, and the purpose of the closure.
- C. All permits are approved for operations during off-peak hours 9:00 a.m. to 4:00 p.m. unless special approval is received.
- D. Operations between the hours of 6:00 p.m. and 10:00 p.m. and Saturdays and Sundays must be approved by the City DWM
- E. Full street closure permits require ninety-six (96) hours advance notice prior to street closure. The following additional information is required prior to approval:
 - 1. The recommended detour route with signage and Traffic Management Plan as per the Manual of Uniform Traffic Control Devices (MUTCD).
 - 2. A copy of the resident and/or business notification letters about the closure. The residents/businesses located between the detour route must be notified about the closure at least five (5) business days prior to the proposed closure.

- F. The City of Atlanta Division of Traffic and Transportation will return full street closure permit applications to the Contractor with a cover letter to the Fire Chief, Chief of Police, Grady Memorial Hospital, MARTA and the Atlanta Board of Education. The Contractor shall have received the permit application and cover letter at least seventy-two (72) hours before commencing street closure activities.
- G. Lane closure permits require a minimum of forty-eight (48) hour notice prior to lane closure. The Contractor shall continuously maintain the safety of the traveling public during lane closures in accordance with the requirements of the MUTCD and as stipulated by public officers.
- H. The City of Atlanta Division of Traffic and Transportation will return the lane closure applications to the Contractor with a cover letter with copies to the Fire Chief, Chief of Police, Grady Memorial Hospital, MARTA and the Atlanta Board of Education. The Contractor shall have received the permit application and cover letter at least seventy-two (72) hours before commencing lane closure activities.

3.02 PREPARATION OF TRAFFIC CONTROL PLANS

The Contractor shall develop detailed staging and traffic control plans for performing specific areas of the Work including but not limited to all requirements for certified flaggers, additional traffic control devices, traffic shifts, detours, paces, lane closures or other activities that disrupt traffic flow. The Contractor shall submit these plans in accordance with the Specifications to receive final approvals from permitting agencies and provide any and all required traffic control devices as required by both the permitting agencies and these specifications at no additional cost to the City DWM.

3.03 CONSTRUCTION PARKING CONTROL

- A. The Contractor shall control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles and City DWM's operations.
- B. The Contractor shall monitor parking of construction personnel's vehicles in existing facilities and maintain vehicular access to and through parking areas.
- C. The Contractor shall prevent parking on or adjacent to access roads or in non-designated areas.

3.04 MAINTENANCE OF TRAFFIC

- A. Whenever and wherever, in the City DWM's opinion, traffic is sufficiently congested or public safety is endangered, the Contractor shall furnish uniformed officers to direct traffic and to keep traffic off the highway area affected by construction operations.
- B. When the Contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of Work the Contractor shall keep

such road, street, or highway open to all traffic and shall provide such maintenance as may be required to safely accommodate traffic. The Contractor shall furnish, erect and maintain barricades, warning signs, flaggers, and other traffic control devices in conformity with the requirements of the local jurisdictions.

- C. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary to ingress into and egress from abutting property or intersecting roads, streets, or highways. The Contractor shall maintain traffic in accordance with any traffic control plans furnished with and made a part of the plan assembly.
- D. The Contractor shall make his own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of traffic as specified in this section.
- E. The cost of maintaining traffic shall be included in the Contractor's bid.

3.05 UNIFORMED POLICE OFFICER FOR TRAFFIC CONTROL

- A. The Contractor shall provide uniformed City of Atlanta police officers to regulate traffic when construction operations are ongoing:
 - 1. In all signalized intersections
 - 2. In streets designated as "collector" streets
 - 3. In all full street closings
 - 4. In GDOT right of ways
- B. Officers will be currently employed by the City of Atlanta, be in full uniform and have full arrest power while working.
- C. Officers will be employed and paid by the Contractor.
- D. It is the officers' responsibility to assist in the direction of traffic within the construction site.

3.06 FLAGGERS FOR TRAFFIC CONTROL

The Contractor shall provide Georgia Department of Transportation (GDOT) certified trained and equipped flaggers to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 FLASHING LIGHTS

The Contractor shall use flashing lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

- A. The Contractor shall consult with authorities and establish public thoroughfares to be used for haul routes and site access and obtain a haul route permit as specified in Section 01060.
- B. The Contractor shall confine construction traffic to designated haul routes.
- C. The Contractor shall provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.09 ROAD CLOSURES ON CITY STREETS AND ROADS

- A. No street or road shall be closed without the permission of the City DWM of any street or road and the fire department having jurisdiction. Prior to closing a street, road or highway, signs shall be posted for a minimum of seven (7) days prior to actual closing, forewarning of the imminent closing. The City DWM shall determine the information to be placed upon the signs by the Contractor. Where traffic is diverted from the Work, the Contractor shall provide all materials and perform all work for the construction and maintenance of all required temporary roadways, structures, barricades, signs and signalization.
- B. To obtain approval to close a road or street maintained by the City, the Contractor shall proceed as follows:
 - 1. The Contractor shall obtain approval of his traffic plan from the City DWM. The traffic plan must be in accordance with the requirements of the City of Atlanta.
 - 2. The Contractor shall obtain a utility permit.
 - 3. The Contractor shall apply in writing to the City and obtain a permit to close the road on a specific date. Routine permit approval by the City requires from one (1) to two (2) weeks depending on when the application is received.
 - 4. The Contractor shall obtain a permit from the City before posting closure signs. Signs must be posted for seven (7) days prior to the first day of closure. Signs shall be acceptable to the City DWM.
 - 5. Emergency road closures will be handled by the City DWM.

3.10 PROCEDURES FOR TRAFFIC DETOUR ROUTE PLAN

- A. The Contractor shall provide a sketch map showing his traffic detour route plan to the City DWM. The sketch map need not be drawn to scale but should resemble, as closely as possible, the actual location. The sketch map shall be drawn in a manner so as to provide emergency agencies a better understanding of the detour for quick response. The sketch map shall include directional arrows showing the flow of traffic.
- B. “Road Closed Ahead” signs shall be erected before the start point of the detour indicating the name of the street closed.
- C. Detour signs with appropriate directional arrows shall be erected at every intersection along the detour route until the end of the detour, when the traffic is back to the original street.
- D. The Contractor shall erect an “End Detour” sign at the end of the detour.
- E. Each detour and “End Detour” sign shall be accompanied by an accessory plate indicating the name of the street being detoured.
- F. The Contractor shall apply appropriate traffic control measures in accordance with the requirements of the MUTCD and the City of Atlanta Department of Public Works.

3.11 BARRICADES AND WARNING SIGNS

- A. The Contractor shall furnish, erect, and maintain all barricades and warning signs for hazards necessary to protect the public and the Work. When used during periods of darkness, such barricades, warning signs and hazard markings shall be suitably illuminated or reflectorized.
- B. For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights, and other traffic control devices in conformity with the requirements of the Georgia Department of Transportation and the City of Atlanta Department of Public Works.
- C. The Contractor shall furnish and erect all barricades and warning signs for hazards prior to commencing Work which requires such erection and shall maintain the barricades and warning signs for hazards until their dismantling.

3.12 REMOVAL

The Contractor shall remove equipment and devices when no longer required and repair damage caused by installation.

3.13 RIGHT OF WAY MANUAL

Included at the end of this Section are copies of the title page and pages 42 through and including page 52 from the City's Right-of Way Manual. These pages include Appendices A, B and C which indicate street designations and Appendix D which covers restrictions for working within the City's right of way. These restrictions shall also apply to GDOT right of ways.

+++ END OF SECTION 01550 +++



City of Atlanta

**Department of Public Works
Office of Transportation**

City's Public Right-of-Way Manual

*Department of Public Works
Office of Transportation
Transportation Engineering
October 2015*

Appendix A:

Arterial Streets

Alphabetical Listing

Note: Streets listed may also be classified as State or Federal Highways and may be identified by a highway number designation.

<u>STREET NAME</u>	<u>SEGMENT</u>	<u>Miles</u>
Baker Street, N.E.	Luckie Street to Piedmont Avenue	0.76
Bankhead Highway, N.W.	Marietta Street to City Limits	6.4
Bell Street, N.E.	Auburn Avenue to Hill Street	0.38
Bolton Road, N.W.	Fulton Industrial Blvd. to Marietta Blvd	3.0
Briarcliff Road, N.E.	Ponce de Leon to City Limits	0.47
Buford Highway, N.E.	City Limits to Piedmont Road	1.1
Campbellton Road, S.W.	Lee Street to 166	4.53
Campbellton Road, S.W.	166 to City Limits	2.65
Candler Road, N.E. & S.E.	City Limits to City Limits	0.70
Capitol Avenue, S.W.	University Avenue to MLK Jr. Drive	1.8
Cascade Road, S.W.	City Limits to Gordon Street	3.06
Central Avenue, S.W.	Dodd Avenue to Edgewood Avenue	1.4
Cheshire Bridge Road, N.E.	Piedmont Road to Buford Highway	1.4
Cleveland Avenue, S.E. & S.W.	City Limits to Jonesboro Road	2.85
Courtland Street, N.E.	North Avenue to MLK Jr., Drive	1.5
Crown Road, S.W.	City Limits to City Limits	0.55
Decatur Street, S.E.	Peachtree Street to Gunby Street	1.4
Dekalb Avenue, N.E.	City Limits to Gumby Street	3.1
East Roxboro Road, N.E.	West Roxboro Road to Wood Circle	0.2
Edgewood Avenue, N.E.	Peachtree Street to Krog Street	1.5
Fulton Industrial Blvd., S.W.	Old Gordon Road to Bolton Road	1.8
Fulton Street, S.W.	Pryor Street to Capitol Avenue	0.4
Georgia Avenue, S.W.	Glenn Street to Capitol Avenue	1.15
Glenn Street, S.E.	Murphy Avenue to Stewart Avenue	0.2
Glenwood Avenue, S.E.	Hooper Street to Clifton Street	2.35
Gordon Street, S.W.	Cascade Avenue to Glenn Street	1.2
Harris Street, N.E.	Luckie Street to Piedmont Avenue	0.7
Hightower Road, N.W.	Bankhead Highway to MLK Jr., Drive	1.7
Hill Street, S.E.	Bell Street to Glenwood Avenue	0.4
Howell Mill Road, N.E.	Collier Road to Marietta Street	2.1
International Blvd., N.E.	Northside Drive to Piedmont Avenue	1.2
James Jackson Parkway, N.W.	City Limits to Bankhead Highway	3.0
Jonesboro Road, S.E.	City Limits to McDonough Blvd.	5.4
Juniper Street, N.E.	14 th Street to North Avenue	1.0
Lakewood Avenue, S.E.	166 to Jonesboro Road	1.1
Lavista Road, N.E.	Cheshire Bridge Road to City Limits	0.18
Lee Street, S.W.	City Limits to West Whitehall St.	2.4
Linbergh Drive, N.E.	Peachtree Road to Cheshire Bridge Road	2.1
Macon Drive, S.E.	Cleveland Avenue to Lakewood Avenue	1.35
Memorial Drive, S.W. & S.E.	Peachtree Street to City Limits	6.0
Marietta Blvd., N.W.	City Limits to West Marietta Street	3.3

Marietta Street, N.W.	Peachtree Street to West Marietta Street	2.5
MLK Jr. Drive, S.E. & N.W.	Hill Street to City Limits	8.7
Mitchell Street, S.W.	Martin Luther King Jr. Dr. to Capitol Avenue	0.9
Moreland Avenue, S.E. & N.E.	Ponce de Leon Avenue to City Limits	5.7
McDonough Blvd., S.E.	Moreland Avenue to University Avenue	2.5
North Avenue, N.W. & N.E.	Northside Drive to Bonaventure Avenue	2.5
Northside Drive, N.W.	Steward Avenue to Northside Parkway	7.1
Northside Parkway, N.W.	Northside Drive to City Limits	3.6
Old Gordon Road, S.W.	MLK Jr. Dr. to Fulton Industrial Blvd	0.38
Peachtree St. & Rd., N.W. & N.E.	Memorial Drive to City Limits	10.0
Peachtree Center Avenue, N.E.	Decatur Street to Edgewood Avenue	0.1
Peachtree Dunwoody Rd., N.E.	Roxboro Road to Meadowbrook Drive	1.9
Peters Street, S.W.	Trinity Street to West Whitehall Street	1.0
Piedmont Avenue, S.E. & N.E.	ML King Jr. Dr. to Cheshire Bridge Road	4.3
Piedmont Road, N.E.	Cheshire Bridge Road to Roswell Road	3.5
Ponce De Leon, N.E.	Peachtree Street to City Limits	3.2
Pryor Street, S.W.	Edgewood Avenue to University Avenue	2.3
Ridge Avenue, S.E.	Capitol Avenue to Pryor Street	0.4
Roswell Road, N.E. & N.W.	Peachtree Road to City Limits	2.7
Roxboro Road, N.E.	Peachtree Road to East Roxboro Road	0.9
Sawtell Avenue, S.E.	McDonough Blvd. to Jonesboro Road	0.7
South West Connector, S.W.	West Marietta Street to Bankhead Highway	1.0
Spring Street, S.W. & N.W.	Peachtree Street to Trinity Avenue	2.25
Stanton Road, S.W.	Campbellton Road to City Limits	0.4
Steward Avenue, S.W.	City Limits to Glenn Street	4.5
Techwood Drive, N.W.	West Peachtree Place to Walker Street	0.95
Trinity Avenue, S.W.	Spring Street to Memorial Drive	0.5
Walker Street, S.W.	Techwood Drive to Peters Street	0.4
Washington Street, S.W.	Martin Luther King Jr. Dr. to Memorial Drive	0.21
West Marietta Street, N.W.	Ashby Street to Marietta Blvd.	0.55
West Peachtree Street, N.W.	Peachtree Street to Peachtree Street	2.2
West Whitehall Street, S.W.	Lee Street to Peters Street	1.52
Whitehall Street, S.W.	Memorial Drive to Murphy Avenue	0.8
Williams Street, N.E.	West Peachtree Place to International Blvd.	0.3
Total # of Arterial Streets = 75	Total # of Miles	158.24

Appendix B: State Routes

STATE ROUTE	FROM	TO
S. R. 3; U.S. 19/41 (Metropolitan Parkway)	A point 50 feet north of Mt. Zion Road (Hapeville city limits)	Northside Drive
S. R. 3 ; U.S. 19/29/41 (Northside Drive)	Metropolitan Parkway	A point 0.10 miles north of Northside Parkway
S. R. 3; U.S. 41 (Northside Parkway)	A point 0.10 miles north of Northside Drive	Cobb County Line
S. R. 8; U. S. 78/278 (Bankhead Highway)	Cobb County Line	Northside Drive
S. R. 8; U. S. 29/78/278 (North Avenue)	State Route 3/US 19/29/41 (Northside Drive)	Piedmont Avenue
S. R. 8 (Ponce De Leon Avenue)	Piedmont Avenue	Dekalb County Line
S. R. 9; U. S. 19 (14th Street)	Northside Drive	West Peachtree Street
S. R. 9; U. S. 19 (West Peachtree Street)	14th Street	Peachtree Street
S. R. 9; U. S. 19 (Peachtree St./Rd.	West Peachtree Street	Roswell Road
S. R. 9; U. S. 19 (Roswell Road)	Peachtree Road	A point 50 feet north of Meadowbrook Drive
S. R. 9; SOUTH (Spring Street)	Peachtree Street	14th Street
S. R. 10 (Freedom Pkwy.)	State Route 401/I-75	State Route 8/Ponce de Leon Avenue
S. R. 13 (Buford Highway)	Peachtree Road	Dekalb County Line
S. R. 14; U. S. 29 (Lee Street)	A point 0.05 miles north of Womack Avenue (East Point city limits)	Avon Avenue
S. R. 14; U. S. 29 (Lee Street/ West Whitehall Street)	Avon Avenue	Chapel Street
S. R. 14 (West Whitehall Street/Peters Street)	Chapel Street	Spring Street
S. R. 42; U. S. 23 (Moreland Avenue)	Dekalb County Line	A point 0.10 miles south of Custer Avenue
S. R. 42; U. S. 23 (Moreland Avenue)	A point 0.10 miles south of Custer Avenue	Ponce de Leon Avenue
S. R. 42; (Briarcliff Road)	Ponce de Leon Avenue	Dekalb County Line
S. R. 42 CONN. (Freedom Parkway Connector)	State Route 10	State Route 42
S. R. 42 SPUR (McDonough Boulevard)	Moreland Avenue	Jonesboro Road
S. R. 54 (Jonesboro Road)	Clayton County Line	Harper Road

S. R. 54 (Jonesboro Rd., McDonough Blvd., University Ave.)	Harper Road	State Route 401/I-75
S. R. 54 CONN. (Sawtell Avenue)	Jonesboro Road	McDonough Blvd.
S. R. 70 (Fulton Industrial Blvd.)	Aviation Circle	Bankhead Highway
S. R. 139 (Ralph David Abernathy Boulevard)	State Route 14/US 29/ W. Whitehall Street	Martin Luther King Jr. Drive
S. R. 139 (Martin Luther King Jr. Drive)	Ralph David Abernathy Drive	A point 0.10 mile west of Old Gordon Road
S. R. 141 (Peachtree Road)	State Route 9	Dekalb County Line

STATE ROUTE	FROM	TO
S. R. 3; U.S. 19/41 (Metropolitan Parkway)	A point 50 feet north of Mt. Zion Road (Hapeville city limits)	Northside Drive
S. R. 3 ; U.S. 19/29/41 (Northside Drive)	Metropolitan Parkway	A point 0.10 miles north of Northside Parkway
S. R. 3; U.S. 41 (Northside Parkway)	A point 0.10 miles north of Northside Drive	Cobb County Line
S. R. 8; U. S. 78/278 (Bankhead Highway)	Cobb County Line	Northside Drive
S. R. 8; U. S. 29/78/278 (North Avenue)	State Route 3/US 19/29/41 (Northside Drive)	Piedmont Avenue
S. R. 8 (Ponce De Leon Avenue)	Piedmont Avenue	Dekalb County Line
S. R. 9; U. S. 19 (14th Street)	Northside Drive	West Peachtree Street
S. R. 9; U. S. 19 (West Peachtree Street)	14th Street	Peachtree Street
S. R. 9; U. S. 19 (Peachtree St./Rd.	West Peachtree Street	Roswell Road
S. R. 9; U. S. 19 (Roswell Road)	Peachtree Road	A point 50 feet north of Meadowbrook Drive
S. R. 9; SOUTH (Spring Street)	Peachtree Street	14th Street
S. R. 10 (Freedom Pkwy.)	State Route 401/I-75	State Route 8/Ponce de Leon Avenue
S. R. 13 (Buford Highway)	Peachtree Road	Dekalb County Line
S. R. 14; U. S. 29 (Lee Street)	A point 0.05 miles north of Womack Avenue (East Point city limits)	Avon Avenue
S. R. 14; U. S. 29 (Lee Street/ West Whitehall Street)	Avon Avenue	Chapel Street
S. R. 14 (West Whitehall Street/Peters Street)	Chapel Street	Spring Street
S. R. 42; U. S. 23 (Moreland Avenue)	Dekalb County Line	A point 0.10 miles south of Custer Avenue
S. R. 42; U. S. 23 (Moreland Avenue)	A point 0.10 miles south of Custer Avenue	Ponce de Leon Avenue
S. R. 42; (Briarcliff Road)	Ponce de Leon Avenue	Dekalb County Line
S. R. 42 CONN. (Freedom Parkway Connector)	State Route 10	State Route 42
S. R. 42 SPUR (McDonough Boulevard)	Moreland Avenue	Jonesboro Road
S. R. 54 (Jonesboro Road)	Clayton County Line	Harper Road
S. R. 54 (Jonesboro Rd., McDonough Blvd., University Ave.)	Harper Road	State Route 401/I-75
S. R. 54 CONN. (Sawtell Avenue)	Jonesboro Road	McDonough Blvd.
S. R. 70 (Fulton Industrial Blvd.)	Aviation Circle	Bankhead Highway
S. R. 139 (Ralph David Abernathy Boulevard)	State Route 14/US 29/ W. Whitehall Street	Martin Luther King Jr. Drive
S. R. 139 (Martin Luther King Jr. Drive)	Ralph David Abernathy Drive	A point 0.10 mile west of Old Gordon Road
S. R. 141 (Peachtree Road)	State Route 9	Dekalb County Line

Appendix C:

Collector Streets

Alphabetical Listing

Note: Streets listed may also be classified as State or Federal Highways and may be identified by a highway number designation.

STREET NAME	SEGMENT	Miles
Alexander Street, N.E.	Marietta Street to West Peachtree Street	0.47
Arizona Avenue, N.E.	Rogers Street to Dekalb Avenue	0.1
Ashby St, S.W. & N.W.	White Street to West Marietta Street	3.5
Atlanta Avenue, S.E.	Capitol Avenue to Boulevard	1.1
Auburn Avenue, N.E.	Peachtree Street to Randolph Street	1.5
Auburn Avenue, N.E.	Randolph Street to Port Street	0.6
Avon Avenue, S.W.	Lee Street to Cascade Avenue	1.5
Austin Avenue, N.E.	Euclid Avenue to Elizabeth Street	0.3
Bakers Perry Road, S.W.	City Limits to M.L.K. Jr. Dr.	2.0
Baker Road, N.W.	Hightower Road to West North Avenue	0.9
Barge Road, S.W.	Stone Road to Fairburn Road	1.4
Barnett Street, N.E.	Ponce De Leon Avenue to Virginia Avenue	0.6
Beecher Street, S.W.	Donnelly Ave to Benjamin E Maya Drive	2.55
Benjamin E. Mays DR SW	Beecher Road to Fairburn Road	2.95
Berne Street, S.E.	Boulevard South East to Moreland Avenue	1.11
Beverly Road, N.E.	West Peachtree Street to Polo Drive	0.7
Bishop Street, N.E.	Howell Mill Road to Mecaslin Street	0.75
Blackland Road, N.E.	Roswell Road to Northside Drive	1.4
Bohler Road, N.W. ~	West Wesley Road to Defoors Perry Road	1.1
Bolton Road, N.W. - I	Barrett Road. To M.L.K. Dr. Drive	2.2
Bolton Road, N.W.	Coronet Way to Marietta Boulevard	0.3
Bouldercrest Drive, S.E.	Flat Shoals Road to Fayetteville Road	0.85
Boulder Park, S.W.	Fairburn Road to Mendell Drive	1.9
Boulevard, S.E.	North Avenue to Edgewood Avenue	1.1
Boulevard, S.E.	McDonough Blvd to Glenwood Avenue	1.95
Boulevard Drive, N.E.	Moreland Avenue to Candler Road	3.4
Brown Mills Rd, SW & SE	Crown Road to Jonesboro Road	4.2
Butler Street, N.E.	Houston St. to Martin Luther King Jr. Dr.	0.7
Butler Road, S.W.	Tell Road to Campbellton Road	1.3
Carroll Drive, N.W.	Chattahoochee Avenue to Marietta Road	0.6
Centra Villa Drive, S.W.	Cascade Avenue to Campbellton Road	1.0
Chappell Road, N.W.	Bankhead Hwy to M.L.King Jr. Dr.	1.2
Chattahoochee Ave, N.W.	Howell Mill Road to Marietta Boulevard	1.0
Cherokee Avenue, S.E.	Memorial Drive to Atlanta Avenue	1.1
Childress Drive, S.W.	Cascade Road to Campbellton Road	1.6
Claire Drive, S.W.	Lakewood Avenue to Pryor Road	0.85
Clifton Road, N.E.	Ponce De Leon Avenue to Dekalb Avenue	0.8
College Avenue, N.E.	Howard Street to City Limits	0.8
Collier Drive, N.W.	Old Gordon Road to Hightower Road	2.7
Collier Road, N.W.	Defoor Hills Road to Peachtree Street	2.4
Confederate Avenue, S.E.	Boulevard South East to Edie Avenue	0.75
Conley Road, S.E.	Jonesboro Road to City Limits	0.7

Constitution Road, S.E.	Jonesboro Road to Macon Highway	1.0
Continental Colony Pkwy S.W	Greenbriar Parkway to Hogan Road	0.6
County Line Road, S.W.	City Limits to City Limits	0.4
County Line Road, S.W.	Tell Road to City Limits	1.8
Custer Avenue, S.E.	Moreland Avenue to Boulevard	1.1
Defoor Avenue N.W.	Howell Mill Road to Collier Road	1.1
Defoor Ferry Road, N.W.	Collier Road to Coronet Way	1.9
Delmar Lane, N.W.	On Ramp to I-285 East Bound	0.9
Delow Drive, S.W.	Campbellton Road to Cascade Avenue	1.3
Derring Road, N.W.	Northside Drive to Peachtree Street	1.0
Dill Avenue, S.W.	Murphy Avenue to Stewart Avenue	0.9
Dodson Drive, S.W.	City Limits to Cascade Road	1.6
Donnelly Avenue, S.W. -	Lee Street to Cascade Avenue	1.2
East Andrews Drive, N.E.	Roswell Road to West Paces Ferry Road	0.4
East Confederate Ave, S.E.	Edie Avenue to Moreland Avenue	0.8
East Morningside Dr, N.E.	Piedmont Ave to East Rock Spring Rd	0.8
East Paces Ferry Rd, N.E.	Piedmont Road to Roxboro Road	1.15
East Rock Spring Rd, N.E.	Morningside Drive to City Limits	0.8
East Wesley Road, N.E.	Piedmont Road to Peachtree Road	1.3
Ellis Street, N.E.	Piedmont Avenue to Peachtree Street	0.3
Empire Boulevard, S.W.	Oak Drive to Brown Mills Road	0.85
Euclid Avenue, N.E.	Moreland Avenue to Austin Avenue	0.2
Fair Street, S.W.	Walker Street to Lawton Street	1.15
Fairburn Road, S.W.	City Limits to Bolton Road	3.35
Fairburn Road, S.W.	City limits to City Limits	4.1
Fayetteville Road, S.E.	Flat Shoals Road to Bouldercrest Drive	0.65
Flat Shoals Avenue, S.E.	Moreland Avenue to Bouldercrest Drive	1.1
Fiat Shoals Road, S.E.	Bouldercrest Drive to Fayetteville Road	0.85
Forrest Park Road, S.E.	Thomasville Drive to Conley Road	3.5
Forsyth Street, N.W.	Whitehall Street to Peachtree Street	0.9
Fort Street, N.E.	Irwin Street to Auburn Avenue	0.2
Fulton Street, S.E.	Capitol Avenue to Connally Street	0.35
Fulton Street, S.W. -	Humphries Street to Pryor Street	0.6
Garmon Road, N.W.	Mount Paran Road to City Limits	0.6
Georgia Avenue, S.E.	Capitol Avenue to Cherokee Avenue	0.75
Gilbert Road, S.E.	Brown Mills Road to City Limits	1.1
Glen Irish Drive, N.E.	Highland Ave to Ponce De Leon Avenue	0.8
Gordon Street, S.W.	Martin Luther King Jr. Dr to Cascade	1.1
Greenbrier Parkway, S.W.	Campbellton Road to Barge Road	1.4
Habersham Road, N.E.	Peachtree Battle Avenue to Roswell Road	2.8
Harbin Road, S.W.	Cascade Road to Campbellton Road	1.3
Hapeville Road, S.W.	Cleveland Avenue to Oak Drive	0.8
Harwell Road, N.W.	Bankhead Highway to Collier Drive -	1.3
Hemphill Avenue, N.W.	Northside Drive to 10th Street	0.40
Hill Street, S.E.	Milton Avenue to Glenwood Avenue	1.65
Hills Avenue, N.W.	Chattahoochee Ave to Defoor Hills Road	0.4
Hillside Drive, N.E.	Powers Ferry Road to Northside Drive	0.8
Highland Avenue, N.E.	Alaska Avenue to Piedmont Avenue	1.14
Hightower Road, N.W.	Bankhead Hwy to James Jackson Pkwy	1.1
Hogan Road, S.W.	City Limits to Continental Colony Pkwy	0.4
Hogan Road, S.W.	Fairburn Road to Stone Road	1.2

Hollywood Road, N.W.	Bolton Road to Bankhead Highways	3.0
Houston Street, N.E.	Butler Street to Peachtree Street	0.4
Howard Street, N.E.	College Avenue to Boulevard Drive	0.6
Huff Road, N.E.	Howell Mill Road to Marietta Boulevard	1.0
Hutchens Road, S.E.	Forrest Park Road to Jonesboro Road	1.1
Irwin Street, N.E.	Lake Avenue to Fort Street	1.0
Jackson Street, N.E.	Decatur Street to Highland Avenue,	0.7
James P Brawley Dr., S.W.	Greensferry Avenue to Bankhead Highway	1.75
Jefferson Street, N.W.	Ashby Street to South West Connector	0.45
Jett Road, N.E.	Powers Ferry Road to City Limits	0.6
Johnson Road, N.W.	Hollywood Road to Perry Boulevard	1.3
Johnson Road, N.E.	Lenox Road to Briar Cliff Road	0.8
Kimberly Road, S.W.	Campbellton Road to Melvin Drive	0.9
Kimberly Road, S.W.	City Limits to City Limits	0.59
Lake Avenue, N.E.	Elizabeth Street to Irwin Street	0.4
Lake Forrest Drive, NW.	Powers Ferry Road to City Limits	2.6
Lakewood Avenue, S.E.	Claire Drive to Milton Avenue	1.1
Lakewood Way, S.E.	Pryor Road to Lakewood Avenue	0.4
Langston Avenue, S.W.	Sylvan Road to Murphy Avenue	1.0
Lawton Street, S.W.	Fair Street to Donnelly Avenue	1.15
Lee Street, S.W.	White Street to West End Avenue	0.8
Lenox Road, N.E.	Cheshire Bridge Road to East Rock Spring	1.45
Lenox Road, N.E.	Peachtree Road to Buford Highway	1.8
Linkwood Road, N.W.	Collier Dr to Martin Luther King Jr. Drive	0.7
Luckie Street, N.W.	North Avenue to Forsyth Street	1.1
Lynhurst Drive, S.W.	Martin Luther King Jr. Dr to Cascade Road	2.2
McDaniel Street, S.W.	Northside Drive to University Avenue	1.7
McLendon Avenue, N.E.	Moreland Avenue to City Limits	1.8
McWilliam Road, S.E.	Brown Mills Road to Forrest Park Road	0.75
Macon Drive, S.W.	Mount Zion Road to Cleveland Avenue	0.6
Marietta Road, N.W.	Perry Boulevard to Bolton Road	2.7
Mason Turner Road, S.W.	Simpson Road to Chappell Road -	0.19
Maynard Terrace, S.E.	Glenwood Avenue to Memorial Drive	0.5
Mecaslin Street, N.E.	Bishop Street to Derring Road	0.2
Milton Avenue, S.E.	Capitol Avenue to Hill Street	0.7
Mitchell Street, S.W.	Martin Luther King Jr., Dr to Magnum St.	0.4
Moores Mill Road, N.W.	Bolton Road to West Paces Ferry Road	3.4
Montgomery Ferry Rd, N.E.	Polo Drive to Piedmont Ave	0.6
Monroe Drive, N.E.	Piedmont Cir to Ponce De Leon Ave	3.1
Mount Gilead Road, S.W.	Fairburn Road to Campbellton Road	1.2
Mount Paran Road, N.W.	City Limits to Paces Ferry Road	2.9
Mount Zion Rd, S.W. & S.E.	Stewart Avenue to Brown Mills Road	1.4
Murphy Avenue, S.W.	Glenn Street to Dill Avenue	1.55
Niskey Lake Road, S.W.	Campbellton Road to County Line Road	1.14
North Avenue, N.E.	Bonaventure Avenue to Oakdale Road	1.1
North Highland Ave, N.E.	East Rock Spring to Alaska Avenue	2.95
Northside Drive, N.W.	Northside Parkway to City Limits -	3.0
Northwest Drive, N.W.	Bolton Road to Hightower Road	1.45
Oakdale Road, N.E.	Dekalb Avenue to City Limits	1.35
Oakland Drive, S.W.	Richland to Campbellton Road	0.8
Old Ivy Road, N.E.	Piedmont Road to Wieuca Road	1.2
Old Hapeville Road, S.W.	Macon Drive to Cleveland Avenue	0.6

Ormond Street, S.E.	Cherokee Avenue to Capitol Avenue	0.75
Parkway Drive, N.E.	Highland Ave to Ponce De Leon Avenue	0.8
Parrott Avenue, N.W.	Bolton Road to Bolton Road	1.0
Peachtree Battle Ave, N.W.	Moore's Mill Road to Peachtree Road	3.2
Peachtree Center Ave N.E.	Edgewood Avenue to Peachtree Street	0.6
Perkerson Road, S.W.	Stewart Avenue to Sylvan Road	1.3
Perry Boulevard, N.W.	Southwest Connector to Hollywood Road	2.9
Peyton Road, S.W.	Benjamin E Mays Drive to M.L.K. Jr. Drive	2.2
Pharr Road, N.E.	Peachtree Road to Piedmont Road	0.75
Piedmont Circle, N.E.	Piedmont Avenue to Monroe Drive	0.1
Polo Drive, N.E.	Beverly Road to Montgomery Ferry Road	0.2
Poole Creek Road, S.W.	Jonesboro Road to Brown Mills Road	1.6
Powers Ferry Road, N.W.	Roswell Road to City Limits	1.9
Pryor Road, S.W.	University Avenue to Lakewood Way	1.6
Ralph McGill Blvd, N.E.	North Avenue to Peachtree Street	2.2
Randolph Street, N.E.	Auburn Avenue to Highland Avenue	0.35
Ridgewood Road, N.W.	Paces Ferry Road to Moore's Mill Road	2.5
Rogers Street, N.E.	Boulevard Drive to Arizona Avenue	0.5
Sandtown Road, S.W. -	Venetian Drive to Cascade Road	1.0
Simpson Road, N.W.	Collier Road to Marietta Street	4.2
S. River Industrial Blvd SE	Forrest Park Road to City Limits	0.6
Stone Hogan Connector SW	Stone Road to City Limits	0.4
Stone Road, S.W.	Fairburn Road to City Limits	1.8
Sydney Street, S.E.	Connelly Street to Cherokee Avenue	0.4
Sylvan Road, S.W.	Murphy Avenue to City Limits	1.9
Techwood Drive, N.W.	10th Street to 16th Street	0.6
University Avenue, S.W.	Stewart Avenue to Ridge Avenue	1.1
Veltre Circle, S.W.	Cascade Road to Benjamin E Mays Drive	0.7
Venetian Drive, S.W.	Cascade Avenue to Campbellton Road	2.0
Virginia Avenue, N.E.	North Highland Avenue to Monroe Drive	0.75
Waters Road, S.W.	Cleveland Avenue to Hapeville Road	0.4
Wells Street, S.W.	Glenn Street to Humphries Street	0.3
West Lake Avenue, N.W.	Bankhead Hwy to MLK Jr. Dr.	1.5
West North Avenue, N.W.	Baker Road to Chappell Road	1.35
West Peachtree Place, NW	Alexander Street. to Peachtree Street	0.38
West Wesley Road, N.W.	Peachtree Road to Ridgewood Road	3.9
West Wieuca Road, N.W.	Loridans Drive to Lake Forrest Drive	0.9
Westmont Road, S.W.	Venetian Drive to Beecher Street	1.3
Westview Drive, N.W.	Cordon Street to West End Avenue	1.7
Weyuan Avenue, S.W.	Capitol Avenue to Ridge Avenue	0.1
White Street, S.W.	Cordon Street to Ashby Street	0.95
Whitefoord Avenue, N.E.	Memorial Drive to Dekalb Avenue	1.0
Wieuca Road, N.E.	Peachtree Road to Loridans Drive	1.6
Willis Mill Road, S.W.	Cascade Road to Campbellton Road	1.3
Wyman Street, N.E.	Memorial Drive to Boulevard Drive	0.4
Zip Industrial, S.E.	Poole Creek Road to Brown Mills Road	0.7
10th Street, N.W.	Monroe Drive to Howell Mill Road	2.4
14th Street, N.W.	Howell Mill Road to Juniper Street	1.7

TOTAL # of Streets = 195

Total # of Miles 246.67

Appendix D:

Time of Day Restrictions for working in the right-of-way

Noted: Include working in inclement weather section

In an effort to minimize the negative effects of noise and traffic congestion caused by construction activities, Time of Day Limitations are imposed on construction activities in certain area of the City.

Unless specifically stipulated otherwise by a written permit from the City of Atlanta:

- No lane of any arterial street shall be blocked for any period between 7:00 AM and 9:00 AM or between 4:00 PM and 6:00 PM.
- No lane of any arterial street shall be blocked for any period exceeding 1 hour between 9:00 AM and 4:00 PM unless a uniformed police officer is employed on site to direct traffic.
- No lane of any street in a commercial or retail zone shall be blocked for any period exceeding 1 hour between 7:00 AM and 6:00 PM.
- No nighttime activities in residential areas, define language 10:00 PM to 7:00 AM excluding maintenance that does not exceed – define levels which requires a noise variance. [74.135 Section](#)
- No activities that create an unacceptable level of noise, dust, or disruption to normal activities of the population

Exceptions to Time of Day Restrictions

In the event of a legitimate emergency, time of day restrictions may be waived.

Emergency

In order to be recognized as an emergency for the waiver of time of day restrictions one or more of the following restrictions must exist:

- Immediate danger to life, health, or property.
- Immediate threat of environmental damage.
- Necessity to repair damage to essential facilities resulting from extreme weather events or traffic accidents.
- Loss of service to customers.
- Immediate response to the problem will result in significantly reduced inconvenience to the public in the long term.
- Delay of repair will result in further damage to facilities.
- Other extraordinary condition that can be documented as an emergency.

Within 24 hours of the occurrence of the emergency, or at the beginning of the next business day, the facility owner must notify the Department of Public Works of the location and nature of the emergency and submit the following as appropriate:

Permit has to be submit within 5 days

- Notice and explanation of any threat to public health or safety.
- Notice and explanation of any threat of environmental damage.
- An engineering plan meeting the Department of Public Works standards, illustrating the work done or remaining to be done.
- A schedule of activities.
- Payment of applicable fees

Additional requirements may apply, depending on the specific circumstances of the event.

Appendix E:

Public Notification Sign

- Signs to be Posted Prior to Construction and to Remain In Place during Construction
- Signs must be Visible and Legible to Vehicles and Pedestrians Traveling in either direction.
- Signs and Lettering should be sized appropriate to Location
- Signs must have a surface area of not less than 3 square feet.
- Lettering must be legible block letters not less than 2" high.

(Example)

Water Main Construction

Work Performed by *(Name of Contractor)*

Under Contract to *(Name of Owner)*

Begin Construction: *(Date)*

Project Duration *(# of Days)*

Address questions and complaints to
(Owner's representative and telephone #)

24-Hour Emergency Contact *(Telephone #)*

Vehicle Identification Signs (refer to GDOT 3.12)

To be displayed in front or rear windshield on each vehicle used on a construction site.

Standard Size: 8 ½" X 11"

Vehicle Identification Signs must be consistent with the Type of Work in Progress

Working under Permit from
City of Atlanta

General Construction
In the Public Right-of-Way

(Name of Contractor)

Under Contract to (Name of Owner)

24-Hour Emergency Contact
(Telephone #)

Working under Permit from
City of Atlanta

Emergency Utility Repair
In the Public Right-of-Way

(Name of Contractor)

Under Contract to (Name of Owner)

24-Hour Emergency Contact
(Telephone #)

Working under Permit from
City of Atlanta

Scheduled Utility Maintenance
In the Public Right-of-Way

(Name of Contractor)

Under Contract to (Name of Owner)

24-Hour Emergency Contact
(Telephone #)

Appendix F:

Areas of Special Impact

Note: City of Atlanta Code of Ordinances - Section 138-126 (i.) In this Code Section, the term “Peachtree Corridor” is used in lieu of the term “Areas of Special Impact”. Until this code section is updated, the terms will be interpreted as being interchangeable.

For the purpose of determining Telecommunication Franchise and Revocable License fees and permits, areas of Special Impact (Peachtree Corridor) shall include:

- Buckhead High Impact Area
- Downtown High Impact Area
- Peachtree/Piedmont/Lindberg High Impact Area

Peachtree/Piedmont/Lindberg High Impact Area

1. All of the City’s public right-of-way of Peachtree Street and Peachtree Road between Interstate Hwy 85 and Pharr Road
2. All of the City’s public right-of-way of Piedmont Road between 14th Street and Pharr Road
3. All of the City’s public right-of-way of Lindberg Drive between Peachtree Road and Piedmont Ave

Buckhead High Impact Area

All of the City’s public right-of-way within an area bounded as follows:

1. Beginning at the Point of Intersection of the southern right-of-way of Pharr Road and the western right-of-way of Peachtree Road, said point being the Point of Beginning,
2. Hence, running northerly along the western right-of-way of Peachtree Road to its intersection with West Paces Ferry Road and Roswell Road,
3. Hence, running northerly along the western right-of-way of Roswell Road to the intersection of Piedmont Road,
4. Hence, running southerly along the eastern right-of-way of Piedmont Road to the intersection of Buckhead Loop,
5. Hence, running easterly along the northern right-of-way of Buckhead Loop to the intersection of Phipps Boulevard,
6. Hence, running northeasterly along the northwestern right-of-way of Phipps Boulevard to the intersection of Wieuca Road,
7. Hence, running southerly along the eastern right-of-way of Wieuca Road to the intersection of Peachtree Street,

8. Hence, running easterly along the northern right-of-way of Peachtree Road to the intersection of Roxboro Road,
9. Hence, running along the eastern right-of-way of Roxboro Road to the Southern Railway crossing,
10. Hence, running westerly along the Southern Railway right-of-way to the crossing of Ga. Hwy 400,
11. Hence, along the western right-of-way of Ga. Hwy 400 to the intersection of Peachtree Road;
12. Hence, running southwesterly along the southern right-of-way of Peachtree Road to the intersection of Piedmont Road,
13. Hence, running southerly along the eastern right-of-way of Piedmont Road to the intersection of Pharr Road,
14. Hence, running westerly along the southern right-of-way of Pharr Road to the intersection of Peachtree Road, and the Point of Beginning.
15. All of the area thus described, lying within the Corporate Limits of the City of Atlanta, 17th District, Fulton County, Georgia.

Downtown High Impact Area

All of the City's public right-of-way within an area bounded as follows:

1. Beginning at the Intersection of the southern right-of-way of Martin Luther King Jr. Drive and the western right-of-way of Northside Drive, said point being the Point of Beginning,
2. Hence, running northerly along the western right-of-way of Northside Drive to the intersection of Interstate Hwy 75,
3. Hence, running easterly along the northern right-of-way of Interstate Hwy 75 and continuing easterly along the northern right-of-way of Interstate 85 to the intersection of Peachtree Street,
4. Hence, running easterly and southerly along the northern and eastern right-of-way of Peachtree Street to the intersection of 14th Street,
5. Hence, running easterly along the northern right-of-way of 14th Street to the intersection of Piedmont Avenue,
6. Hence, running southerly along the eastern right-of-way of Piedmont Avenue to the intersection of Interstate Hwy 75/85 (Downtown Connector),
7. Hence, running southerly along the eastern right-of-way of Hwy 75/85 (Downtown Connector) to the intersection of Memorial Drive,
8. Hence, running along the southern right-of-way of Memorial Drive to the intersection of Spring Street,
9. Hence, running northerly along the right-of-way of Spring Street to the intersection of Martin Luther King, Jr. Drive and the point of beginning.
10. All of the area thus described, lying within the Corporate Limits of the City of Atlanta, 17th District, Fulton County, Georgia.

Peachtree/Piedmont/Lindberg High Impact Area

1. All of the City's public right-of-way of Peachtree Street and Peachtree Road between the intersections of Interstate Hwy 85 on the south and Pharr Road on the north; and
2. All of the City's public right-of-way of Piedmont Road between 14th Street on the south and Pharr Road on the north; and
3. All of the City's public right-of-way of Lindberg Drive between Peachtree Road on the west and Piedmont Ave. on the east;
4. All of the area thus described, lying within the Corporate Limits of the City of Atlanta, 17th District, Fulton County, Georgia.

Appendix G: Requirements for street, sidewalk and lane closure permit

Procedures for Granting Full Street and Lane Closure Permits for Construction Purposes

- Applications are either faxed or brought in personally to the Office of Transportation.
- The applications are dated, stamped, and assigned to the Permit Engineer.
- The applications shall indicate the time (in days); the length (in feet); the number of lanes and purpose of the closure
- All permits are approved for operations during the off-peak hours of 9 a.m. to 4 p.m.
- Work done between the hours of 6 pm and 10 pm is approved by the Commissioner of Public Works. Work done between the hours of 10:01 p.m. and 9 a.m. is governed by Article IV. Noise Control – Section 74 of the City of Atlanta Code of Ordinances. Section 74 – 139 permits the condition for the temporary variance.

Full Street closures lasting up to 90 Days:

Full street closure permits require 96 hours notice prior to the commencement of the project. The following additional information is required prior to being approved:

1. A copy of detour route with signage and traffic management plan as per the Manual of Uniform Traffic Control Devices (MUTCD)
2. A copy of notification letter to residences and businesses within a 3 block radius informing them of the closure at least five (5) business days prior to the proposed closure.
3. A signed and dated letter (by the applicant) listing residences and businesses that were notified about the closure.
4. All residences and businesses affected by the closure must be notified.

Full Street closures lasting between 90 Days and 6 months:

1. A 30 calendar day notification will be provided by the applicant to businesses and residents that are located on or have access points on the street that is proposed for closure within a 1 block radius.
2. The applicant will be required to mail or hand delivery, a copy of the notice to the impacted Neighborhood Planning Unit and neighborhood association representing the impacted street 30 calendar days prior to closure.
3. Businesses and/or residents, impacted Neighborhood Planning Units and/or neighborhood association within a 3 block radius should be notified at least 15 calendar days in advance.

4. The applicant will be required to obtain signatures of receipt by the business owners, single family home owners or residents, signatures of the impacted property's managers or authorized representative of multi-family dwellings such as apartments and condominiums.
5. The applicant will be required to submit a copy of the document signed by impacted businesses and residents as outlined above.

The applicant will be required to submit a sworn affidavit stating that he or she complied with notification requirements outlined above.

Full Street closures lasting longer than 6 months:

1. A 45 calendar day notification will be provided by the applicant to businesses and residents that are located on or have access points on the street that is proposed for closure within a 1 block radius.
2. The applicant will be required to mail or hand delivery, a copy of the notice to the impacted Neighborhood Planning Unit and neighborhood association representing the impacted street 45 calendar days prior to closure
3. Businesses and/or residents, impacted Neighborhood Planning Units and/or neighborhood association located within a three (3) block radius should be notified at least 30 calendar days in advance.
4. The applicant will be required to obtain signatures of receipt by the business owners, single family home owners or residents, signatures of the impacted property's managers or authorized representative of multi-family dwellings such as apartments and condominiums.
5. The applicant will be required to submit a copy of the document signed by impacted businesses and residents as outlined above.

The applicant will be required to submit a sworn affidavit stating that he or she complied with notification requirements outlined above.

The Office of Transportation shall attach a cover letter addressed to the applicant and copied to the Fire Chief; the Chief of Police; Grady memorial Hospital; MARTA; the Atlanta Board of Education. This correspondence should be dated and faxed at least 72 hours before commencement of the project.

- Lane closures shall require a minimum of 24 hours notice prior to the commencement of the project, and require traffic control plan per the MUTCD and Police Officers. The safety of the public must be maintained at all times. With the exception of single lane closure that are the result of routine maintenance and repair for a limited duration of time and scope.

- Lane closure permits are issued between the hours of 8:30 a.m. and 1 p.m. Mondays to Fridays.

Street, Sidewalk & Lane Closures for Franchise Utilities are issued in PWOPS

Appendix H:

Utility Permits Issuance Process

1. Request is received by the Traffic Engineering Section from the Utility Company (4 copies)
 - a. Two copies are reviewed for compliance with city code. Are profiles and/or plans (horizontal as well as vertical locates) included, if required based upon method of construction. To be reviewed within 10 business days of receiving the permit.
 - b. The lane or street closure requests can be reviewed and issued within 10 business days after step (a) above.
 - c. A copy is given to the inspector assigned to that Utility Company, to do a preliminary review of the request. The inspector denotes any differences or possible concerns i.e. vaults in the sidewalk, brick pavers etc. not noted on plans. The inspector also determines if any other company is currently working at or in close proximity to the requested location. To be reviewed and return within 15 business days of step (a) above.
2. After traffic permits from Traffic Operations and preliminary reviews from inspectors in Street Operations are received, i.e. a maximum of 15 business days, the Street Operations Unit's database is checked for open permits at the requested location. Checks are also made by the inspector for any unresolved issues with the requestor, which will impact issuance of the requested permits. If no conflicts are found the permits must be issued, per section 138-65 of the city code, within 60 days.
 - a. If there are problems, in sections 1 (a)-(c) make the requestor aware of them via email, U.S. Mail or by telephone within 20 business days from receipt of the permit.
 - b. If there is open permit at the location, a second permit shall not be issued unless an exception is granted by the Department of Public Works. Wait until the existing permit is closed, by the inspector, before issuing another permit. If after 60 days the permit has not been completed, notify the requestor in writing (as to why the permit has not been issued) via email or by U. S. Mail.
 - c. If there are no problems, stamp, date and sign (include cost, if applicable) two copies and deliver them to the permit clerk before 4:00 p.m. Timeframe for issuance by section 138-65 of the city code of ordinances, no longer than 60 days.

- d. The permit clerk calls the contact person listed on the permit, informing them the permit is being issued.
- e. The permit clerk provides the requestor with the Department of Public Works permit (1 copy) and also provides Public Works with the same permit (1 copy) with drawings. The packet is given to inspector monitoring the Utility Company until completion.

Street, Sidewalk & Lane Closures for Franchise Utilities are covered in PWOPS

SECTION 01610
TRANSPORTATION AND HANDLING

PART 1 GENERAL

1.01 SCOPE

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

1.02 TRANSPORTATION

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

1.03 HANDLING

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

- D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

(NOT USED)

+++ END OF SECTION 01610 +++

SECTION 01 71 23
CONSTRUCTION SURVEYING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Surveyor qualifications
 2. Submittals
 3. Survey reference points
 4. General survey requirements
 5. Survey documentation of the Work

1.02 QUALITY ASSURANCE

- A. Record surveys for review and approval shall be performed by an independent surveying firm with a Registered Land Surveyor (RLS) licensed and registered in the State of Georgia, retained by the Contractor.
- B. Day to day surveying for Contractor's control purposes may be performed by Contractor's own surveyors.

1.03 SUBMITTALS

- A. Prior to start of the Work, submit qualifications documentation for the proposed RLS. Documentation shall include: name, address, telephone number, and photocopy of registration of RLS.
- B. Verify topographic mapping provided by the Owner. Spot check inverts and critical elevations shown on the survey.
- C. Prepare a Survey Methods Plan outlining proposed methodology for accomplishing all surveying tasks necessary to complete the Work.
- D. At completion of the Work, submit record survey drawings in AutoDesk AutoCAD format utilizing the E-transmit command for the entire drawing set. The documents shall include all information (including x-refs, fonts, and Owner's pen tables) to provide a complete set of record survey drawings. The record survey drawings shall also be provided in complete PDF file format, and at least one complete half-size and full size sets of hard copy drawings. Record surveys shall be certified by the Contractor's RLS.
- E. Redline mark-ups of the Contract Drawings are not acceptable. A digitized tracing of a manually drawn record survey drawing, derived from non-digital surveying techniques, is also not acceptable.

1.04 SURVEY REFERENCE POINTS

Contractor's RLS shall establish survey control monuments for horizontal and vertical control for the Work. Control datum for survey is that indicated on the

Drawings. Control monuments shall be placed in areas that will not be impacted by subsequent construction activities.

- A. Contractor's RLS shall establish additional temporary benchmarks and horizontal control points as required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL SURVEY REQUIREMENTS

- A. Utilize recognized engineering survey practices appropriate for obtaining the information specified.
- B. Protect and preserve permanent reference points during construction. Promptly report to Owner and Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons. Replace dislocated reference points based on original survey control at no additional cost to the Owner.
- C. Establish elevations, lines and levels required for all items of the Work.

3.02 SURVEYS FOR MEASUREMENT AND PAYMENT

- A. If required by the Contract, perform surveys to determine quantities for unit price items, including control surveys to establish measurement reference lines. Notify Owner and Engineer prior to starting surveys.
- B. Submit calculations and certify the correctness of quantities for payment purposes. Owner and Engineer will confirm quantities prior to payment.

3.03 SURVEY CONTROL MONUMENTS

- A. Establish at the completion of the Work, a minimum of 2 permanent (brass disks) survey control monuments on the project site, referenced to established control points. Record survey control monument locations and elevations on the record survey drawings.

3.04 SURVEY DOCUMENTATION OF THE WORK

- A. Field surveys shall be performed during construction to verify that the Work has been constructed to the required cross-sections, elevations and limits shown on the Drawings.
- B. The surveys shall be accomplished using grade stakes, GPS equipment, or other suitable survey equipment. All survey equipment shall be calibrated on-site on a daily basis and prior to any data collection
- C. Maintain a complete and accurate log of control and survey work as it progresses.

- D. Record survey drawings shall be prepared to fully document the Work as specified in individual specification sections.
- E. Promptly submit record survey documentation to Engineer for review at critical stages of construction as specified.
- F. Contractor's RLS shall prepare and certify the record survey drawings.
- G. Include record survey documentation with the Project Record Documents as specified in Section 01 77 00.

END OF SECTION

**SECTION 02000
SITE WORK**

PART 1 GENERAL

1.01 SCOPE

This section outlines site work requirements that are applicable to all site work operations. Refer to specification sections for specific product and execution requirements.

1.02 QUALITY ASSURANCE

- A. Comply with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.
- B. Obtain and pay for all required inspections, permits and fees. Provide notices required by governmental authorities.

1.03 PROJECT CONDITIONS

- A. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations at Contractor's expense.
- B. Thirty (30) days before start of site work operations, Contractor shall submit to City DWM, a Demolition and Utility and Services Abandonment Plan (that includes the requirements of Section 2.3 of the Basis of Design Report) for its review and comment. City DWM comments will be submitted in writing to Contractor for its consideration within ten (10) days of receipt of such plan. Contractor will arrange for disconnection or disconnect and seal or cap all utilities and services designated to be removed before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.
- C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the City DWM and the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.
- D. Locate, protect, and maintain bench marks, monuments, control points and project reference points. Reestablish disturbed or destroyed items at Contractor's expense.
- E. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks and other adjacent facilities.

- F. Obtain governing authorities' written permission when required to close or obstruct street, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.
- G. Control dust caused by work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.
- H. Protect existing buildings, paving and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items at Contractor's expense.
- I. Protect and maintain street lights, utility poles and services, traffic signal control boxes, curb boxes, valves and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, parking meters and postal mail boxes with the applicable governmental agency. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.
- J. Preserve from injury or defacement all vegetation and objects designated to remain.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Materials and equipment: As selected by the Contractor, except as indicated in Contract Documents. Contractor will notify City DWM of selected materials and equipment before procurement.

PART 3 EXECUTION

3.01 GENERAL

- A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.
- B. Consult the records and drawings of adjacent work and of existing services and utilities which may affect site work operations.

+++ END OF SECTION 02000 +++

**SECTION 02050
DEMOLITION**

PART 1 - GENERAL

1.01 SCOPE:

- A. The work covered under this Section includes furnishing all labor, equipment and material required to remove building structures, abandoned utilities, curbing, site walls, utility structures and pavement designated for demolition as shown on the Drawings, directed by the Engineer or required for the completion of the Work, including all necessary saw cutting, excavation and backfilling.
- B. The work specified herein and shown on the Drawings is intended to show the extent of the scope of this work but must not be construed as covering it entirely. The Contractor shall visit the site and judge the amount of work required and the problems anticipated in the performance of the work.
- C. (Not Used)
- D. (Not Used)

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:
 - 1. The Contractor shall submit to the Engineer, prior to beginning work, a schedule of demolition and detail the methods to be used.
 - 2. The Contractor shall develop and submit a demolition plan which includes a demolition schedule that covers:
 - a. Stationing from and to with start and finish dates.
 - b. Proposed method of demolition.
 - c. Approved haul routes and permit(s) to and from the site.
 - d. Locations of wood piles.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The Contractor shall provide all materials and equipment in suitable and adequate quantity as required to accomplish the work shown, specified herein, and as required to complete the project.

PART 3 - EXECUTION

3.01 GENERAL

A. Do not close or obstruct streets, walks, drives, or other occupied or used spaces or facilities without the written permission of the DWM. Do not interrupt utilities serving occupied or used facilities without written permission of the DWM. If necessary, provide temporary utilities.

B. Shutdown of Existing Operations and Utilities

1. Remove existing trees and stumps to at least 2 feet below grade.
2. Prior to making any pavement removals, saw cut pavements to full depth.
3. Not Used.

C. PROTECTION

1. Take care to prevent the spread of dust and flying particles. Sprinkle rubbish and debris with water to keep dust to a minimum. Install, operate, and maintain erosion control measures at all times.

D. PERSONNEL: Perform work by personnel experienced in this type work and in such a manner as to eliminate hazards to persons and property without interference with new work and with use of adjacent areas, public rights-of-way, utilities and structures.

3.02 CONCRETE DEMOLITION

A. Reuse of Broken Concrete

1. Stockpile pieces of broken concrete for temporary stormwater energy dissipation. Break concrete to roughly 4-Inch cubes.

3.03 MASONRY DEMOLITION (Not Used)

3.04 REMOVAL OF EXISTING EQUIPMENT AND PIPING (Not Used)

3.05 PROTECTION OF WORK AND EXISTING FACILITY

A. Perform the work in a manner that will not damage parts of the site, or systems not intended to be removed. If in the opinion of the Engineer, the method of demolition or cutting may endanger or damage parts of the structure(s) or affect the operation of the facilities, promptly change the method when so notified by the Engineer. Perform all cutting required regardless whether such cutting is specifically indicated. Examine the existing structures, evaluate conditions to be encountered in accomplishing the work, and accommodate such requirements accordingly in the Bid

Proposal.

- B. The Contractor shall exercise full care and shall use such methods and equipment during removal as will maintain the usefulness of vehicular access to telecommunications and antennas at the site at all times.
- C. Any damage done to structures or equipment during removal and any patching, plugging of holes or repairs necessitated because of removal of equipment and piping shall be repaired to the satisfaction of the Engineer and the cost thereof shall be included in the Contract Price.

3.06 DISPOSAL

- A. Disposal: All rubble and waste material shall be hauled off site as it is removed. Stockpiling is not permitted at any time. The Contractor shall be fully responsible for proper disposal of waste materials in accordance with all federal, state and local laws at no additional cost to the DWM.
- B. Contractor shall not dispose of any trash, material, equipment, or litter on the site. Contractor shall be responsible for any damage to any facilities, tanks or equipment which is damaged by any such foreign material.

3.07 DISPOSITION OF SALVAGEABLE MATERIALS (Not Used)

3.08 REHABILITATION (Not Used)

+++ END OF SECTION 02050 +++

**SECTION 02110
CLEARING AND GRUBBING**

PART 1 -GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for all clearing and grubbing including, but not limited to, the removal from the site of trees, stumps, roots, brush, structures, abandoned utilities, trash, debris and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated.
- B. The extent of clearing is that minimum degree of clearing necessary to carry out all construction activities including construction of appurtenances. Areas protected by silt fences, tree save and other fencing shall not be disturbed at any time.
- C. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion control requirements.
- D. Clearing operations include, but are not limited to, the following:
 - 1. Protection of existing trees and other vegetation
 - 2. Removal of trees and other vegetation
- E. Related Work Specified Elsewhere:
 - 1. Division 1 General Requirements
 - 2. Section 02125, Temporary and Permanent Erosion and Sediment Control.
 - 2. Section 02050, Demolition.
 - 4. Section 02200, Earthwork.

1.02 JOB CONDITIONS

- A. Protection of Existing Improvements:
 - 1. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing improvements.
 - 2. Protect improvements on adjoining properties as well as those on the project site. Restore improvements damaged by this work to their original condition, as acceptable to the Engineer. Replace property line monuments (such as iron pins) removed or disturbed by clearing operations under the direction of a Land Surveyor licensed in the State of Georgia.
- B. Protection of Existing Trees and Vegetation:

1. Protect existing trees and other vegetation to avoid cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within driplines, foot or vehicular traffic, and parking of vehicles or equipment within drip line. Provide temporary fences, barricades or guards as required to protect trees and vegetation to be left standing.
2. Provide protection for tree roots over 1-1/2 inches diameter that are cut during any construction operation. Coat the cut faces with emulsified asphalt, or other acceptable coating, especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots of trees with wet burlap to prevent roots from drying out; provide earth cover as soon as possible.
3. Repair or replace damaged trees and vegetation resulting from any construction operation, in a manner acceptable to the Engineer. A qualified arborist approved by the engineer shall perform tree damage repair at no cost to the City. Replace damaged trees that cannot be repaired and restored to full-growth status, as determined by the Engineer.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXISTING TREES AND VEGETATION

- A. Avoid cutting or injuring trees designated to remain. Other trees cut or injured shall be solely at Contractor expense to obtain permits, approvals, and pay all fees to the City before cutting and hauling off site.

3.02 CLEARING AND GRUBBING

- A. Clearing operations shall begin no more than seven days before beginning construction work for any area.
- B. Materials to be cleared, grubbed and removed from the project site include but are not limited to vegetation, trees, stumps, roots, lawns, shrubbery, gardens, paving, miscellaneous structures, debris, and abandoned utilities to the minimum practicable extent to complete the work. Limit clearing to a single lane work route without provision for construction vehicles to pass utility operation.
- C. Grubbing shall consist of completely removing roots, stumps, trash and other debris from all areas to be graded so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.
- D. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Stumps and roots larger than 1 inch shall be grubbed and removed to a depth not less than 4 feet below grade. All holes or cavities which extend below the sub grade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material.
- E. Where the tree limbs interfere with utility wires, or where the trees to be felled are in

close proximity to utility wires, raw water reservoir, telecommunication facilities, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

- F. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
- G. All fences adjoining any excavation or embankment that, in the Contractor's opinion, may be damaged or buried, shall be carefully removed, stored and replaced. Any fencing that is damaged shall be replaced with new fence material of equal or better quality and construction.
- H. Stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material
- I. Burying of residual materials and organics will not be allowed.
- J. The Contractor shall utilize special precautions required for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the construction area but not directly within excavation and/or fill limits. The Contractor shall be responsible for repair or replacement of any items damaged as a result of its operations.
- K. The Contractor shall utilize on-site waste sorting.

3.03 HOLES AND DEPRESSIONS

- A. Fill holes, depressions and voids created or exposed by clearing operations with non-organic soil material approved by the Engineer.
- B. Backfill pavement removal areas with non-organic top soil in horizontal layers not exceeding six inches loose-depth and compact to 95 per-cent standard Proctor.

3.04 DISPOSAL OF WASTE MATERIALS

- A. Disposal General Requirements: Dispose cleared matter daily so as to maintain site in a safe and neat condition throughout the contract period. Owners of the property may remove merchantable timber, buildings or other items from the worksite before the Contractor begins operations, and no assurance exists that any such material will be on the worksite when the Contractor begins work.
- B. On-Site Disposal:
 - 1. When authorized by the Engineer, cut tree trunks and limbs, over two inches in diameter, into 48 inch lengths and neatly stack within work limits on the same property as that on which the tree originally grew.

- C. The debris resulting from the clearing and grubbing operation shall be hauled to a

disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall any material or debris be left on the project site, shoved onto abutting private properties, or buried on the project site.

3.05 SITE ENVIRONMENTAL PROCEDURES

- A. Waste Management: As specified in Section 01351 – Construction Waste Management and as follows:
1. Mulch: Identify organic debris that is free of disease, pest infestation, and chemical contamination and that is suitable for recycling on site. Chip suitable organic debris for use as mulch on site. Stockpile where indicated on Drawings or directed by Engineer. Coordinate with requirements of Section 02900 – Trees, Plants and Ground Covers.
 2. Topsoil: Where existing topsoil is scheduled to be removed; carefully strip and stockpile separately for reuse. Topsoil stockpiles shall be covered from the elements. Stockpile where indicated on Drawings or directed by Engineer. Coordinate with requirements of Section 02900 – Trees, Plants and Ground Covers.
 3. Compost: Identify organic debris suitable for composting on site. Coordinate with requirements of Sections 01351 – Construction Waste Management and 02900 - Trees, Plants and Ground Covers.
- B. Solarizing Soil:
1. Within 48 hours of subsoil preparation, saturate soil with water to a depth of 3 feet. Immediately stake polyethylene sheeting over area to be planted. Stake tightly to surface of soil. Maintain sheeting in place for a minimum of 6 weeks.
 2. Immediately after removing sheeting, cover area to be planted with topsoil. Do not till soil prior to applying topsoil.

+++ END OF SECTION 02110 +++

SECTION 02125
TEMPORARY AND PERMANENT EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE

- A. Work under this section includes furnishing all labor, materials, equipment and incidentals required to install and maintain temporary and permanent erosion and sedimentation controls as shown on the Drawings and as specified herein. Work under this Section also includes the subsequent removal of temporary erosion and sedimentation controls at completion of the project.
- B. Temporary and permanent erosion and sedimentation controls include mulching and grassing of disturbed areas and structural barriers at those locations which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by the Georgia Environmental Protection Division (EPD) and applicable codes, ordinances, rules, regulations and laws of local and municipal authorities having jurisdiction.
- C. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. The Contractor shall notify the Engineer of any changes and/or additions to the erosion and sedimentation control measures necessary to accommodate the Contractor's means and methods of operation. Any additional erosion and sedimentation control measures required by the Contractor's means and methods of operation will be installed by the Contractor at no additional cost to the City.
- D. The Contractor shall be solely responsible for the control of erosion and sediment production within the Project area. The Contractor shall install controls that will ensure that storm water and drainage from the disturbed area of the Project site will be filtered or otherwise managed to minimize impacts on receiving waters and/or existing storm drains. Discharged waters shall be free of soil particles and shall meet all applicable permit turbidity requirements.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents.

1.03 QUALITY ASSURANCE

- A. The Contractor shall designate a worksite erosion control supervisor. The supervisor shall have the responsibility and authority to coordinate all equipment, personnel and materials needed to maintain project site erosion and sediment control in accordance with the management practices and standards established in the Manual for Erosion

and Sediment Control in Georgia and the Drawings and Specifications.

- B. Within 15 days after receipt of the Notice to Proceed, the Contractor shall submit the name and contact data for the designated erosion control supervisor. The supervisor shall be an individual with an active minimum Level 1 certification as issued by the Georgia Soil and Water Conservation Commission.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Silt fence: Silt fence shall be as detailed on the Drawings and shall meet the requirements of Section 171 – Silt Fence of the GDOT Department of Transportation Standard Specifications.
 - 1. Silt fence fabric shall conform to GDOT Standard Specification Section 881.2.07.
 - 2. Silt fencing shall conform to GDOT Standard Specification Section 894.
 - 3. Silt fence posts and bracing shall conform to GDOT Standard Specification Section 862.
- B. Hay bales shall be clean, seed-free cereal hay type, rectangular in shape.
- C. Woven wire fence backing shall be ½-inch, galvanized steel, chicken-wire mesh.
- D. Filter stone shall be crushed rock conforming to Georgia Department of Transportation Table 800.01, Size Number 57.
- E. Concrete block shall be hollow, non-loadbearing type.
- F. Concrete shall be 3000 psi in accordance with Section 03300, Cast-in-Place Concrete.
- G. Plywood shall be ¾-inch thick exterior type.
- H. Materials shall be sourced a maximum distance of 50 miles.

2.02 RIP RAP

- A. Use only one method throughout the Project.
- B. Stone Rip Rap shall consist of sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Rip rap shall have less than 66 percent wear when tested in accordance with AASHTO T-96. Unless shown on the Drawings or specified otherwise, stone rip-rap shall be type 3. Rip rap shall be sourced a maximum of 50 miles from the Site.

1. Type 1 Rip Rap: The largest pieces shall have a maximum approximate volume of two cubic feet. At least 35 percent of the mass shall be comprised of pieces which weigh 125 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10 percent of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia Department of Transportation Standard Specification Section 805 - Stone Dumped Rip Rap, Type 1.
2. Type 3 Rip Rap: The largest pieces shall have a maximum approximate volume of one cubic foot. At least 35 percent of the mass shall be comprised of pieces which weigh 15 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10 percent of the total mass. Rockfines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia Department of Transportation Standard Specification Section 805 - Stone Dumped Rip Rap, Type 3.

2.03 FILTER FABRIC

Filter fabric for use under rip-rap shall meet the requirements of GDOT Standard Specification Section 881.2.05 for plastic filter fabric.

2.04 CONSTRUCTION EXIT STONE

Stone shall be sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Aggregate size shall be in accordance with the National Stone Association Size R-2 (1.5 to 3.5-inch stone) or Type 3 Riprap as specified in paragraph 2.02 of this Section.

2.05 GRASS

Permanent grass shall be of the same type that existed prior to construction.

2.06 WATER

- A. Water shall be free of excess and harmful chemicals, organisms and substances which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used.
- B. Water shall be furnished by the Contractor.

2.07 EROSION CONTROL FABRIC

Erosion control fabric shall be equal to Futerra Erosion Control Blanket manufactured by Profile Products LLC. Fabric shall be a non-woven erosion control/vegetation blanket comprised of wood fiber and crimped, interlocking synthetic fibers laminated by an accelerated photodegradable polypropylene netting. Fabric shall be 100% bio-degradable and photo-degradable within 10 months of installation.

PART 3 EXECUTION

3.01 GENERAL

- A. Basic Principles
 - 1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.
 - 2. Minimize the disturbed area and the duration of exposure to erosion elements.
 - 3. Stabilize disturbed areas immediately.
 - 4. Safely convey run-off from the site to a stable outlet.
 - 5. Retain sediment on site that is generated on site.
 - 6. Minimize encroachment upon watercourses.
- B. Temporary Erosion and Sedimentation Control: Temporary erosion and sedimentation control procedures shall be directed toward:
 - 1. Preventing soil erosion at the source.
 - 2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.
 - 3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.
- C. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of waterways and to prevent erosion of the Project site.

3.02 SEDIMENTATION AND EROSION CONTROL MEASURES

- A. Temporary and permanent erosion and sedimentation control measures shall prevent erosion and prevent sediment from exiting the site. If, in the opinion of the Engineer, the Contractor's temporary erosion and sedimentation control measures are inadequate, the Contractor shall provide additional maintenance for existing measures or additional devices to control erosion and sedimentation on the site at no additional cost to the Owner.
- B. All erosion and sedimentation control devices and structures shall be inspected by the Contractor at least once a week and immediately prior to and after each rainfall

occurrence. Any device or structure found to be damaged shall be repaired or replaced by the end of the day. Sediment ponds shall be cleaned out prior to the silt reaching the height or elevation shown on the Drawings.

- C. All erosion and sedimentation control measures and devices shall be constructed and installed as shown on the Drawings or specified herein and maintained until adequate permanent disturbed area stabilization has been provided or permanent pavement has been installed and accepted by the Engineer. After adequate permanent stabilization has been provided or permanent pavement has been installed and accepted by the Engineer, all temporary erosion and sedimentation control structures and devices shall be removed.

3.03 SEDIMENT CONTROL

A. Construction Exit

1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Engineer. A construction exit shall be located at any point traffic will be leaving a disturbed area to a public right-of-way, street, alley, sidewalk, or parking area.
2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The plastic filter fabric shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.
3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights-of-way and paved surfaces as directed by the Engineer.
4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of when the disturbed area has been properly stabilized, the tracking or flow of soil onto public right-of-way or paved surfaces has ceased and as directed by the Engineer.

B. Sediment Barriers

1. Sediment barriers shall include, but are not necessarily limited to, silt fences, hay bales, rock check dams and inlet sediment traps and any device which prevents sediment from exiting the disturbed area.
2. Silt fences, hay bales and rock check dams shall not be used in any flowing stream, creek or river.

3. Sediment barriers shall be installed as shown on the Drawings and as directed by the Engineer.
4. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one half of the original height of the barrier or as directed by the Engineer. Torn, damaged, destroyed or washed out barriers shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Engineer.
5. Sediment Barrier Removal
 - a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover or permanent pavement has been installed and the sediment barrier is no longer required as directed by the Engineer.
 - b. Accumulated sediment shall be removed from the barrier and removed from the site.
 - c. All non-biodegradable parts of the barrier shall be disposed of properly. The hay bales may be spread evenly across disturbed areas as a mulching material.
 - d. The disturbed area created by barrier removal shall be permanently stabilized.

3.04 EROSION CONTROL

A. Grassing

1. Grassing shall be as specified in paragraph 3.05 of this Section
2. Temporary Stabilization: Temporary stabilization shall be provided as shown on the Drawings and conforming to these Specifications to control erosion on the site. Temporary stabilization shall be provided to any area which will not receive permanent stabilization within the next 14 calendar days. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.
3. Permanent Stabilization
 - a. Permanent stabilization shall be provided as shown on the Drawings and conforming to these Specifications to control erosion on the site. Permanent stabilization shall be provided to all areas of land disturbance within seven calendar days of the completion of land disturbance for any area greater than 0.25 acre. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.
 - b. Grass or sod removed or damaged in residential areas shall be replanted with the same variety within seven calendar days of the completion of work in any area.

- c. Where permanent stabilization cannot be immediately established because of an inappropriate season, the Contractor shall provide temporary stabilization. The Contractor shall return to the site at the appropriate season to provide permanent stabilization in areas that received only temporary stabilization.

B. Erosion Control Blanket

1. Erosion control blankets shall be applied to sloped areas as indicated on the Drawings and where in excess of 2 to 1 slope. Blankets shall be laid on finished grades that have been seeded, insuring good contact with the soil. Soil surface shall be smooth and free of rocks, roots, debris and other obstructions.
2. Secure blankets with biodegradable staples or stakes at the top of slopes in a 6-inch deep x 6-inch wide anchoring trench. Secure blankets with staples or stakes per the manufacturer's recommendations, increasing the spacing at overlapping edges. Blankets shall be overlapped by a minimum of 8-inches. Provide a 6-inch deep x 6-inch wide anchoring trench at the toe of the slope or shoreline.

3.05 GRASSING

A. General

1. Refer to Section 02933, Seeding for detailed specifications on permanent seeding.
2. When final grade has been established, all bare soil, unless otherwise required by the Contract Documents, shall be seeded, fertilized and mulched in an effort to restore to a protected condition.
3. Specified permanent grassing shall be performed at the first appropriate season following establishment of final grading in each section of the site.
4. All references to grassing, unless noted otherwise, shall relate to establishing permanent vegetative cover as specified herein for seeding, fertilizing, mulching, etc.
5. Permanent grassing shall be of a perennial species.

- B. Grassing activities shall comply with Section 02933, *Seeding* and the Manual for Erosion and Sediment Control in Georgia, specifically for the selection of species, planting dates and application rates for seeding, fertilizer and mulching. Where permanent vegetative cover (grassing) cannot be immediately established (due to season or other circumstances) the Contractor shall provide temporary vegetative or mulch cover.

3.06 RIP-RAP

- A. Unless shown otherwise on the Drawings, rip-rap shall be placed at all points where banks of streams or drainage ditches are disturbed by excavation, or at all points where their natural vegetation is removed. Carefully compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction alongside a stream or drainage ditch as well as crossing a stream or drainage ditch.
- B. When trenching across a creek, place rip-rap a distance of 10 feet upstream and 10 feet downstream from the top of the trench excavation. Place rip rap across creek bottom, across creek banks and extend rip-rap placement five feet beyond the top of each creek bank.
- C. Preparation of Foundations
 - 1. The ground surface upon which the rip rap is to be placed shall be brought in close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers.
 - 2. Unless at creek banks or otherwise shown or specified, rip-rap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet deep in original ground, and the side next to the fill or cut shall have that same slope. After the rip-rap is placed, the toe ditch shall be backfilled.
- D. Placement of Filter Fabric
 - 1. The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be placed loosely so as to give and therefore avoid stretching and tearing during placement of the stones.
 - 2. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of rip-rap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to the City.
- E. Placement of Rip-Rap

1. The rip-rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Rip-rap shall be placed with its top elevation conforming to the finished grades or the natural slope of the stream bank and stream bottom.
2. The stones shall be dropped no more than 3 feet during construction.
3. Stone rip-rap shall be dumped into place to form a uniform surface and to the thickness specified on the Drawings. The thickness tolerance for the course shall be -6-inches and +12-inches. If the Drawings do not specify a thickness, the course shall be placed to a thickness of not less than 18-inches.

3.07 CLEAN-UP

Remove and dispose of all excess erosion and sedimentation control devices and materials when no longer needed or at the completion of construction as directed by the Engineer.

+++ END OF SECTION 02125 +++

**SECTION 02150
SHEETING, SHORING AND BRACING**

PART I GENERAL

1.01 SCOPE

- A. This section specifies requirements for sheeting, shoring, and bracing of trenches and excavations greater than five (5) feet in depth. Where shoring, sheeting, bracing or other supports are necessary, they shall be furnished, placed, maintained, and except as specified otherwise, removed by the Contractor.

- B. Design Requirements:
 - 1. The design, planning, installation and removal, if required, of all sheeting, shoring, lagging, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.
 - 2. The Contractor shall design sheeting, shoring, and bracing in accordance with the OSHA Safety and Health Standards as well as state and local requirements.
 - 3. Horizontal strutting below the barrel of a pipe and the use of pipe as support are not acceptable.
 - 4. When the construction sequence of structures requires the transfer of bracing to the completed portions of any new structure or to any existing structure, the Contractor shall perform a complete design analysis of the expected impact of that bracing on the structure. This action shall in no way absolve the Contractor of responsibility of damage resulting from said bracing.

1.02 REFERENCES

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

Reference	Title
OSHA 2207	OSHA Safety and Health Standards, Current Edition

1.03 SUBMITTALS

- A. Prior to starting any excavation work requiring sheeting, shoring, and bracing, the Contractor shall prepare plans for trench and excavation support systems. No provisions of the above requirements shall be construed as relieving the Contractor of his overall responsibility and liability for the work.

- B. The Contractor shall submit a Certification of Compliance properly identified with the project name and project location to the City DWM. The Certification shall state that the sheeting, shoring and bracing have been designed in accordance with the prevailing codes and standards by a Professional Engineer registered in the State of Georgia with the Engineer's seal and signature appearing on the certification. Calculations shall not be submitted unless specifically requested by the City DWM.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. The construction of sheeting, shoring and bracing shall not disturb the state of soil adjacent to the trench and below the excavation bottom.

- B. Trench sheeting below the top of a pipe shall be left in place.

- C. Excavation shall not be started until the design for support systems has been accepted by the Engineer.

+++ END OF SECTION 02150 +++

**SECTION 02200
EARTHWORK**

PART 1 – GENERAL

1.01 SCOPE

- A. The work under this Section includes earthwork and related operations, including, but not limited to excavating all classes of material encountered; trenching; handling; storage; transportation; and disposal of all excavated and unsuitable material; construction of fills and embankments; backfilling around structures; backfilling all pits; compacting; all sheeting; shoring and bracing; preparation of subgrades; surfacing and grading; and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the Work.
- B. The Contractor shall provide all services, labor, materials, and equipment required for all earthwork and related operations necessary or convenient to the Contractor for furnishing complete Work as shown on the Drawings or specified in these Contract Documents.
- C. Related Work specified elsewhere:
 - 1. Section 02125, Erosion and Sedimentation Control
 - 2. Section 02225, Trenching and Trench Backfilling
 - 3. Section 02700, Removing and Replacing Pavement

1.02 GENERAL

- A. Safety: Comply with local regulations and with provisions of the “Manual of Accident Prevention in Construction” of the Associated General Contractors of America, Inc. Occupational Safety and Health Act (OSHA) and all other applicable safety regulations.
- B. Existing site topography is taken from the best available data and are intended to give reasonable information about the existing elevations. The Contractor shall verify conditions to determine the exact quantities of excavation and fill required.
- C. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.
- D. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the City DWM. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material at no cost to the City DWM.

- E. The Contractor shall control grading in a manner to prevent water running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can flow uninterrupted in existing open ditches or channels; other surface drains; or temporary drains.
- F. No classification of excavated materials will be made. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the Work, regardless of the type, character, composition or condition thereof.
- G. The soil testing will be performed by the Contractor's testing laboratory. As a minimum at least one density test shall be performed for every 5,000 square feet of fill area and every two feet of fill lift. Soil test results will be submitted to the City DWM for informational purposes.
- H. Should the City DWM choose to conduct its own testing, the Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests. The cost of all retests made necessary by the failure of materials supplied by the Contractor, his agents or subcontractors, to conform to the requirements of the Contract shall be paid by the Contractor. Contractor shall provide at least 24 hours advance notice of earthwork operations to the Testing Laboratory. Testing Laboratory shall provide reports to the City DWM with copies to the Contractor certifying (and sealed by a Registered Georgia Engineer) that earthwork is in conformance with the plans and specifications. The Testing laboratory shall witness the placement of all fill.
- I. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations.
- J. Stockpile Areas: Provided there is space available, stockpiling material may be on site.

1.03 SUBMITTALS

The following specific information shall be provided to the City DWM:

- A. Copies of permits obtained by the Contractor for the work.
- B. Test results, certification of compliance, and source for all imported materials.
- C. Test reports for compaction.

1.04 QUALITY ASSURANCE

Reference Standards. Comply with all Federal, State and local laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:

- A. ASTM C136-84a, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

- B. ASTM D1556-82, Test Method for Density of Soils in Place by the Sand Cone Method.
- C. ASTM D1557-78, Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.5-kg) Rammer and 18-in. (457-mm Drop).
- D. ASTM D3107-88, Test Method for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

PART 2 – PRODUCTS

2.01 MATERIALS

A. Earthwork Materials

1. Controlled Fill:

- a. Proposed fill soils shall be laboratory tested prior to construction use to determine their suitability for use.
- b. Notification: For approval of imported fill material, notify the Testing Laboratory at least three (3) weeks in advance of intention to import material, designate the proposed borrow area, and permit the Testing Laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material. Test results shall be submitted to the City DWM for review and informational purposes. All fill shall be free of organic matter or debris, have a low to moderate plasticity, ($PI \leq 15$) uniform composition, and be free of rock fragments greater than three inches in dimension. Soils selected for use as fill material shall also have a standard Proctor (ASTM D 698) maximum dry density of at least 90 pounds per cubic foot.
- c. All on-site fill material shall be soil exclusive of organic matter, frozen lumps or other deleterious substances.
- d. It shall contain no rocks or earth clumps over 3-inches maximum in dimension.
- e. Fill, backfill, and aggregate require sourcing from within 50 miles of the Site, and source shall be documented.

2. Structural Fill and Structural Backfill:

- a. Select on site materials may be suitable. Testing and recommendation of suitability shall be made by the Testing Laboratory and test results and recommendation will be submitted to the City DWM for informational purposes prior to its use..

- b. Imported material shall be sand, uniformly graded crushed rock or other select material recommended by the Testing Laboratory. Graded aggregate base material as specified in Section 02700 is acceptable for structural fill and backfill.
 - c. Crushed Rock: Crushed rock used for bedding and drainage stone shall conform to the Georgia Department of Transportation Standard Specifications for construction of Road and Bridges, Section 800 for No. 57 Stone.
3. Coarse Aggregate: Coarse aggregate shall conform to the Georgia Department of Transportation Standard Specifications of Transportation Systems construction of Road and Bridges, Section 800 for No. 57 Stone, Group II, and shall have the following gradation:

Sieve size	Percent Passing	
	1-½ inch	100
1 inch	95	100
¾ inch	-	-
½ inch	25	60
3/8 inch	-	-
#4	0	10
#8	0	5

4. Top Soil: Dark organic weed free loam.
- B. Sheeting, Bracing and Timbering: The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures, or utilities outside of the trench or pit.
1. General:
- a. All cofferdams, sheeting, bracing and timbering shall be designed, sealed and signed by a registered Professional Engineer in the State of Georgia at the Contractor's expense. A copy of the drawings and design computations shall be submitted to the City DWM for the project files.
 - b. Sheeting, bracing and timbering shall be so placed as to allow the Work to be constructed to the required lines and grades.
 - c. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe the City DWM may suggest and the Contractor shall consider additional bracing and support necessary to furnish the added degree of safety. The Contractor shall

provide such added bracing and support by such method as Contractor may elect to use, but the taking of such added precautions shall in no way relieve the Contractor of sole and final responsibility for the safety of lives, work and structures.

- d. All sheeting and shoring in contact with the concrete or masonry shall remain in place. The sheeting or shoring above the structure may remain in place or be cut off. No sheeting shall be left in place within three feet below the ground surface.
- e. There shall be no payment for sheeting, bracing, and timbering left in place.

2. Timber:

- a. Timber may be substituted for steel sheet piling. Timber for shoring, sheeting or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.
- b. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the work and adjacent property. Leave sheeting in place when it cannot be safely removed. Cut off sheeting left in place below the finished ground surface by three feet.

3. Steel Sheet Piling:

Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral or vertical movement at all times. The Contractor shall prepare closure and sealing details between sheet piling and existing facilities, as well as an acceptable method of excavation within sheet piling before commencing with construction operations. Contractor shall be responsible for all damage to existing utilities and structures resulting from installation of sheet piling. Damage to existing utilities and/or structures resulting from installation of sheet piling shall be repaired at the Contractor's expense.

C. Other Materials: All other materials not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor..

D. Stockpile area: Contractor shall determine location for stockpile areas within the limits of disturbance. This area shall be used to stockpile soil material for backfilling around structures and to stockpile needed topsoil.

PART 3 – EXECUTION

3.01 GENERAL

- A. Benching of Slopes: When the embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when the embankment is to be built ½ width at a time, the slopes that are steeper than 4:1 as measured at right angles to the embankment shall be continuously benched over those areas as the work is brought up in layers. Benching shall be of sufficient width to permit the operation of placing and compacting equipment. Each successive cut shall begin at the intersection of the original ground and the vertical side of the previous cut. Material thus cut shall be re-compacted along with the new embankment material. Proof roll subgrade prior to placement of fill material.
- B. Topsoil:
1. Remove all topsoil to a depth at which subsoil is encountered, from all areas, which are to be cut to lower grades or filled.
 2. Topsoil to be used for finish grading shall be stored on the site. It shall be piled properly, sloped to drain and covered.
- C. Bracing and Sheeting:
1. Furnish, install, and maintain all sheeting, bracing, and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth, which could in any way injure the work, adjacent property, or workmen.
 2. Properly support all trenches for duct bank installation so as to conform to all pertinent rules and regulations. All trenches deeper than 5 feet shall be shored unless cut to the angle of repose of the excavated soils.
 3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.
 4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work. The cost of removing sheeting or bracing shall be at the Contractor's expense.
 5. All sheeting and shoring in contact with concrete or masonry shall remain in place. The sheeting and shoring above the structure may remain or be cut off. No sheeting or shoring left in place shall be within three feet below the ground surface.
- D. Obstructions:
1. Remove and dispose of all trees, stumps, roots, boulders, pavement, pipes and the like, as required for the performance of the work.

2. Exercise care in excavating around catch basins, inlets, manholes, piping, duct banks, underground vaults, etc.
3. Avoid removing or loosening castings or pushing dirt into structures.
4. Damaged or displaced castings shall be repaired and replaced, and dirt entering the structures during the performance of the work shall be removed at no additional cost to the City DWM.

E. Utilities to be Abandoned:

1. When pipes, conduits, sewers or other structures are removed from the trench leaving dead ends in the ground, such ends shall be fully plugged and sealed in accordance with City DWM requirements.
2. Abandoned structures such as manholes, catch basins or chambers shall be entirely removed in accordance with City DWM requirements unless partial removal is agreed to in writing by the City DWM.
3. All materials from abandoned utilities which can be readily salvaged shall be removed from the excavation and stored on the site. The Contractor will notify the City DWM of such materials and its location on the site..
4. All salvageable materials will remain the property of the City DWM unless otherwise indicated.

F. Unsuitable Subgrade:

Should soft material, which, in the opinion of the Testing Laboratory is not suitable, be encountered in the bottom of a trench or underneath a structure, the soft material shall be removed and replaced with structural fill or coarse aggregate.

G. Cutting Paved Surfaces and Similar Improvements:

1. Remove existing pavement as necessary for installing utilities and appurtenances.
2. Before removing any pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks to match the width of the trench.
3. Sawcut the asphalt pavement along the marks before breaking away from the part of pavement that should remain.
4. Do not pull pavement with machines until completely broken and separated from pavement to remain.
5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. Refer to Section 02700 for replacement of damaged or removed pavement.

NOTE: No additional payment will be made for removing and replacing damaged adjacent pavement.

6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
7. The Contractor may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

H. Dewatering:

1. Furnish, install, maintain and operate necessary pumping and other equipment for dewatering the various parts of the Work and for maintaining the foundation and other parts free from water as required for constructing each part of the Work.
2. By the use of well points, pumps, tile drains or other approved methods, the Contractor shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.
3. Excavations shall be continuously dewatered to maintain a ground water level no higher than 3 feet below the lowest point in the excavation.
4. Piezometric observation wells shall be required, to monitor the ground water level, to insure proper dewatering prior to excavation below the static water table. The number of wells required will vary depending on the size and depth of structures and shall be included in the plan.
5. The cost for all dewatering and discharge shall be at the Contractor's expense and shall be considered incidental.

3.02 EXCAVATION

A. Method:

1. All excavation shall be by open cut from the surface without prior City DWM approval.
2. All excavations for appurtenances and structures shall be made in such manner and to such depth and width as will give ample room for building the structures and for bracing, sheeting, and supporting the sides of the excavation, for pumping and draining groundwater and wastewater which may be encountered, and for the removal from the trench of all materials excavated.
3. Water shall not be allowed to accumulate in excavations. Contractor shall provide sufficient temporary pumping to assure that surface and ground waters do not saturate foundation soils.

4. Take special care so that soil below the bottom of the structure to be built is left undisturbed.

B. Grades: Excavate to lines and grades required and approved by City DWM.

C. Disposal of Excavated Material:

1. Remove and legally dispose of all excavated material not needed to complete filling, backfilling, and grading.
2. Dispose of excess excavated material at locations secured by the Contractor and in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street or alley. No debris shall be deposited on any private property except by written consent of the property owner. In no case shall any material be left on the Project site, or be buried in embankments or trenches on the Project site. With recommendation of the Testing Laboratory and approval by the City DWM, demolished, crushed concrete may be acceptable for use in fill areas.
3. Excavated materials shall be placed adjacent to the work to be used for backfilling as required.
4. Excavated materials shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and to not cause any drainage problem. Excavated material shall be placed so as to not damage existing landscape or man-made improvements. Surcharging of any bank is not allowed.

D. Rock Excavation:

1. Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades required. . The Contractor shall be responsible for obtaining any blasting permits required.
2. If excess excavation is made or the material becomes disturbed so as to require removal below final subgrade elevations or beyond the prescribed limits, the resulting space shall be refilled with Class B concrete in accordance with Section 03300.

3.03 EXCAVATING FOR STRUCTURES

A. Excavation:

1. All excavation is unclassified.
2. Excavation shall include all substances to be excavated. Excavation for structures shall be to limits not less than 2 feet outside wall lines, to allow for formwork and inspection.

3. Where rock excavation is carried below grade the Contractor shall backfill to grade using concrete or structural fill.
 4. Where unsuitable material is encountered excavate material to a depth acceptable to the Testing Laboratory and confirmed by the City DWM and fill with compacted structural fill as required.
- B. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock or compacted materials to insure proper bearing.
1. Unsuitable Foundation Material
 - a. Any material in the opinion of the Testing Laboratory which is unsuitable for foundation shall be removed and replaced with coarse aggregate or structural fill material.
 - b. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.
 2. Foundation in Rock: Foundations for a structure shall be on similar materials. Should excavation for a foundation be partially in rock, the Contractor shall undercut that portion of the rock 12-inches and bring the excavation to grade with compacted, crushed stone.

C. Construction Observations:

All excavations should be examined prior to reinforcing steel placement to verify that the design bearing pressure is available. All excavations should be clean, level and free of ponded water, mud and loose, frozen or water-softened soils. If it is necessary for an excavation to remain open overnight, or if rain is imminent, a 3- to 4-inch thick "mud mat" of Class B concrete may be placed in the bottom of the excavation to protect the bearing soils until reinforcing steel and concrete can be placed.

D. Unsuitable Bearing:

If unsuitable bearing for foundations is encountered at the required elevations, the Testing Laboratory shall be notified immediately and a determination made for its proper remedy.

3.04 EXCAVATION BELOW GRADE AND REFILL

If the bottom of any excavation is taken out below the approved limits, it shall be refilled to the bottom grade, at the Contractor's expense. The refill shall be 6-inch layers of structural fill or other material satisfactory to the Testing Laboratory.

3.05 BACKFILL AND FILL PLACEMENT

- A. Compaction of fill shall be accomplished by placing the fill material in horizontal lifts of eight inches (8") maximum loose thickness and mechanically compacting each lift to at least the specified dry density.
- B. All fill placement shall be witnessed by an experienced soils technician of the Testing Laboratory and fill density and moisture tests for each lift shall be performed to verify that the specified degree of compaction is being achieved.
- C. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed as described under Excavation. Area to receive fill shall then be scarified to a depth of at least 6-inches.
- D. The fill shall be brought to the proposed elevation by placing and compacting only acceptable and approved fill materials upon a subgrade.
- E. Fill materials shall be placed in continuous approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practicable.
- F. The fill shall be placed at a moisture content that corresponds to +/- 3% of the optimum moisture content, as determined by the standard Proctor moisture-density relationship test.
- G. Compaction:
 - 1. The fill shall be uniformly compacted to a dry density that corresponds to at least 95% of the standard Proctor maximum dry density (ASTM D 698) of the fill soil.
 - 2. The upper twelve-inches (12") of fill beneath the structures and pavement areas shall be compacted to 98% of the standard Proctor maximum dry density.
 - 3. Scarification and re-compacting of the upper fill soils immediately prior to the slab-on-grade and/or pavement construction shall be required.
 - 4. Compaction of embankments shall be by sheepsfoot rollers with staggered uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one (1) row of knobs shall be 250 psi. Placement and compaction of materials shall extend beyond the final contours sufficiently to insure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer or grader shaping the face of the embankment.
 - 5. The backfill placement in trenches and behind structures shall be uniformly compacted to a dry density that corresponds to at least 95% of the standard Proctor maximum dry density (ASTM D 698) of the fill soil. In confined areas requiring

portable compaction equipment the fill material shall be placed in horizontal lifts of four inches (4") maximum loose thickness.

6. If tests indicate that density of backfill fill is less than that specified, the area shall be either be re-compacted or undercut, filled, and compacted until specified density is achieved.

H. Final Grading: Upon completion of construction operations, the area shall be graded to approved finish contour elevations and grades. Graded areas shall be made to blend with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

I. Moisture:

1. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.
2. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

J. Proofrolling:

1. All areas where sidewalks, pavement, or structures are to be built on compacted fill shall be proof rolled to detect soft spots prior to the placement of fill material or construction of foundations.
2. Proofrolling shall consist of the moving a 20-30 ton loaded dump truck or pneumatic tire roller over the subgrade after the subgrade is shaped. Proofrolling shall be witnessed by the City DWM.
3. Pneumatic-tired rollers shall have not fewer than four pneumatic tired wheels which shall be of such size and ply that tire pressures can be maintained between 80 and 100 pounds per square inch for 25,000 pound wheel load during rolling operations. Unless otherwise required, rolling shall be done with tires inflated to 90 psi. The roller wheels shall be located abreast in a rigid steel frame. Each wheel shall be loaded with an individual weight box so that each wheel will bear an equal load when traversing uneven ground. The weight boxes shall be suitable for ballast loading such that the load per wheel shall be 25,000 pounds. The spacing of the wheels shall insure that the distance between the nearest edges of adjacent tires shall be not greater than one-half of the tire width of a single tire at the operating pressure for a 25,000 pound wheel load. The roller shall be operated not faster than 5 feet/second.
4. Subgrade shall be proofrolled with 6 passes. Depressions that develop during the proofrolling operation shall be filled with suitable material and those filled areas shall be proofrolled with 6 passes. If, after having been filled and proofrolled, the subgrade still contains depressions, the soil shall be undercut to the full depth of the soft material or 5 feet whichever is less, backfilled, and rolled to achieve a compacted subgrade.

5. After the proofrolled subgrade has been accepted by the Contractor, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 0.04 feet at every point.
 6. Conduits, pipes, culverts and underdrains shall be neither disturbed nor damaged by proofrolling operations. Rollers shall neither pass over, nor approach closer than 5 feet to conduits, pipes, culverts and underdrains unless the tops of those facilities are deeper than 3 feet.
- K. During wet or rainy periods, aeration (drying) shall be required to reduce the fill materials to the required moisture condition. During dry periods, water shall be added to achieve the proper moisture content for compaction. Silty soils, which are wet, shall require aeration prior to compaction even during dry periods.

3.06 BACKFILLING AROUND STRUCTURES

General:

1. Remove debris from excavations before backfilling.
2. Do not backfill against foundation walls until so instructed by the Contractor.
3. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.
4. Do not backfill on only one (1) side of vertically spanning walls unless walls are adequately shored or permanent construction is in place to furnish lateral support on both top and bottom of wall.

3.07 GRADING

A. General:

1. Perform all rough and finish grading required to attain the approved elevations.
2. Perform rough grading to an accuracy of plus or minus 0.10 feet.

B. Grading Around Buildings: Control the grading around buildings so the ground is pitched to prevent water from running into the excavated areas of a building or damaging other site features.

C. Treatment After Completion of Grading:

1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the Contractor.

2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.08 EXCESS WATER CONTROL

A. Unfavorable Weather:

1. Do not place, spread or roll any fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to the Contractor.
3. Any inundated area that freezes shall be removed and refilled at the Contractor's expense.

B. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collected in depressions.

C. Pumping, Drainage and Dewatering:

1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the Work.
2. Dewater by means, which will insure dry excavations, preserve final lines and grades, and do not disturb or displace adjacent soil.
3. All pumping and drainage shall be done with no damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic or the work of other contractors, and in accordance with all pertinent laws, ordinances, and regulations.
4. Do not overload or obstruct existing drainage facilities.

3.09 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments, which may occur within one (1) year after final acceptance of the Work by the City DWM.
- B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within thirty (30) days after receipt of written notice from the City DWM.

3.10 CLEANING

Upon completion of the work of this Section, remove all rubbish, trash and debris resulting from construction operations. Remove surplus equipment and tools. Leave the site in a

neat and orderly condition acceptable to the City DWM, and in conformance with the Contract Documents.

+++ END OF SECTION 02200 +++

**SECTION 02223
EXCAVATION BELOW NORMAL GRADE AND CRUSHED STONE REFILL**

PART 1 GENERAL

1.01 SCOPE

- A. If the material at or below the normal grade of the bottom of the trench is unsuitable for foundation, it shall be removed to depth as required to establish a suitable foundation and replaced with crushed stone. Normal grade of trench bottom is defined as follows:

Pipe Diameter (Inches)	Normal Grade below Pipe (Inches)
8 - 21	8
24 or greater	12

- B. Normal grade below manholes, vaults and other structures shall be 12 inches.
- C. Pipe bedding material is not included in the scope of this Section.

PART 2 PRODUCTS

2.01 MATERIALS

Crushed Stone shall be as specified in Section 02225.

PART 3 EXECUTION

3.01 EXCAVATION AND DRAINAGE

- A. Whatever the nature of unstable material encountered or the ground water conditions, drainage in excavations shall be complete and effective.
- B. If the Contractor excavates below grade through error or for his own convenience, or fails to properly dewater the excavation, or disturbs the sub grade before dewatering is sufficiently complete, he may be directed by the City DWM to excavate below grade as set forth in the preceding paragraph, in which case the work excavating below grade and finishing and placing the refill shall be performed at the Contractor's own expense.

3.02 REFILL

If the material at the level of trench bottom is unsuitable for foundations, the Contractor may undertake compaction of the unsuitable soil or remove the unsuitable material to such depth and width as Contractor determines and replace with crushed stone.

+++ END OF SECTION 02223 +++

**SECTION 02225
TRENCH EXCAVATION AND BACKFILL**

PART 1 GENERAL

1.01 SCOPE

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

1.02 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
1. ASTM C33 – Standard Specification for Concrete Aggregates
 2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 3. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
 4. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using A Vibratory Table
 5. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
 6. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft³)
 8. ASTM D2937 – Standard Method for Density of Soil in Place by the Drive-Cylinder Method
- B. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D698, except that for cohesionless, free draining soils "maximum dry density" shall mean the maximum index density as determined by ASTM D4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D1556, ASTM D6938 or ASTM D2937.
- C. Sources and Evaluation Testing: Testing of materials to certify conformance with the project requirements shall be performed by an independent testing laboratory.

1.03 SUBMITTALS

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

1.04 SAFETY

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

1.05 TESTING

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

PART 2 PRODUCTS

2.01 TRENCH FOUNDATION MATERIALS

Crushed Stone: Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive. Sourcing is required from within 50 miles of the Site and source shall be documented.

2.02 BEDDING AND HAUNCHING MATERIALS

- A. Water Mains
 - 1. Unless specified otherwise, bedding and haunching materials shall be suitable materials that have been excavated from the trench and are acceptable for use as pipe bedding and haunching. Materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials.
 - 2. Crushed stone, if utilized for bedding and haunching, shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.
- B. Sewers and Storm Drains: Crushed stone utilized for bedding and haunching shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.
- C. Filter Fabric - Non-Woven Type
 - 1. Filter fabric associated with bedding shall be a UV stabilized, spun bonded, continuous filament, needle-punched, polypropylene, non-woven geotextile.
 - 2. The fabric shall have an equivalent open size (EOS or AOS) of 120 - 70. The fabric shall also conform to the minimum property values listed in the following table:

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

4. Filter fabric shall be equal to Polyfelt TS 700, Trevira 1125 or SuPac 7-MP.

2.03 INITIAL BACKFILL

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

2.04 FINAL BACKFILL

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

provide select material conforming to the requirements of this Section.

2.05 SELECT BACKFILL

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

2.06 CONCRETE

Concrete for bedding, haunching, initial backfill, or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 60. Sourcing is required from within 100 miles of the Site and source shall be documented.

2.07 FLOWABLE FILL

- A. Controlled strength flowable fill shall be used as trench backfill when site conditions warrant.
- B. Controlled low strength flowable fill shall conform to Section 600 of the Georgia Department of Transportation Standard Specifications for Construction of Roads and Bridges – latest edition.
- C. Flowable fill design mix shall be for “excavatable” fill. Design mix shall be in accordance with Section 600.3.03 of the GDOT Standard Specifications.

2.08 GRANULAR MATERIAL

Granular material, where required for trench backfill, shall be sand, river sand, crushed stone or aggregate, pond screenings, crusher run, recycled concrete, or other angular material. Granular material shall meet gradation requirements for Size No. 57 or finer. Sourcing is required from within 50 miles of the Site and source shall be documented.

2.09 GRADED AGGREGATE BASE

Graded aggregate base shall be Class “A” meeting the requirements of the Georgia Department of Transportation Specification Section 815.01. Sourcing is required from within 50 miles of the Site and source shall be documented.

PART 3 EXECUTION

3.01 TRENCH EXCAVATION

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

2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems.
3. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements and also allow access to valves and hydrants.

3.02 SHEETING, SHORING AND BRACING

- A. Sheeting, shoring and bracing is specified in Section 02150.
- B. Protection of the excavation against caving or settling of the banks shall be the sole responsibility of the Contractor. The Contractor shall protect the sides of his excavation by sheeting and bracing as may be necessary.
- C. The Contractor shall furnish, put in place and maintain sheeting and bracing required to support the side of the excavation and prevent loss of ground which could damage or delay the work or endanger adjacent structures or vehicular traffic. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
- D. The Contractor shall leave in place to be imbedded in the backfill of the trench, all wood sheeting, bracing and other related items, or which the Contractor may determine to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Contractor may determine that timber used for sheeting and bracing in the trench be cut off at any specified elevation, after backfilling and tamping has reached this level.
- E. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction of other structures, utilities or property, whether public or private.
- F. The right of the City DWM to recommend sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheeting and bracing to prevent any caving or moving of the ground adjacent to the sides of the trench.
- G. The Contractor shall receive no payment, other than that included in the price to be paid for pipe, for any extra timber used for sheeting, bracing and other related items. The Contractor shall receive no payment for such timber which was used for the convenience of the Contractor.

3.03 TEST PITS

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

3.04 ROCK EXCAVATION

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

3.05 DEWATERING EXCAVATIONS

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

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

3.06 TRENCH FOUNDATION AND STABILIZATION

- A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.
- B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench bottom shall be considered unsuitable and the Contractor will stabilize trench by over excavating trench bottom and filling with crushed stone.
- C. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.

- D. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 95 percent of the maximum dry density, unless shown or specified otherwise.

3.07 BEDDING AND HAUNCHING

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

2. Bedding and haunching materials within the limits of restrained joint pipe shall be compacted to a minimum of 95 percent of the maximum dry density, unless shown or specified otherwise.

3.08 INITIAL BACKFILL

- A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.
- B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least 12-inches above the pipe barrel. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.
- C. Backfill on both sides of the pipe simultaneously to prevent side pressures.
- D. Compact each layer thoroughly with suitable hand tools or tamping equipment.
- E. Initial backfill shall be compacted to a minimum 95 percent of the maximum dry density, unless shown or specified otherwise. Initial backfill within the limits of restrained joint pipe shall be compacted to a minimum 95 percent of the maximum dry density, unless shown or specified otherwise.
- F. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section for initial backfill.

3.09 CONCRETE ENCASUREMENT FOR PIPELINES

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

3.10 FINAL BACKFILL

- A. Backfill carefully to restore the ground surface to its original condition.
- B. The top 6-inches of backfill shall be topsoil or graded aggregate base material, depending upon the trench location.
- C. Excavated material which is unsuitable for backfilling, and excess material, shall be disposed of in a manner approved by the Contractor. Surplus soil may be neatly distributed and spread over the site, if approved by the City DWM, except that surplus

- soil shall not be distributed and spread over the site in areas under Corps of Engineers jurisdiction. If such spreading is allowed, the site shall be left in a clean condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.
- D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.
- E. Pipelines: After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:
1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack".
 2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet.
- F. Manholes, Vaults and other Structures:
1. Backfilling shall be carried up evenly on all walls of an individual structure simultaneously. A variation of 2-feet in elevation will be the maximum allowable. Backfill shall not be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength.
 2. In locations where pipes pass through walls, the Contractor shall take the following precautions to consolidate the backfill up to an elevation of at least 2-feet above the bottom of the pipe:
 - a. Place fill in such areas for a distance of not less than 3-feet either side of the centerline of the pipe in level layers not exceeding 6-inches in depth.
 - b. Thoroughly compact each layer with a power tamper.
 3. Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against construction loads, hydraulic pressure and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.
- G. Final backfill shall be compacted to a minimum 95 percent of the maximum dry density, unless specified otherwise. Final backfill underlying pavement and backfill under dirt and gravel roads and within the limits of restrained joint pipe shall be compacted to a minimum 95 percent of the maximum dry density, unless specified otherwise.
- H. Concrete or bituminous asphalt removed during construction shall not be placed in backfill.

- I. The surface of filled areas shall be graded to smooth true lines in conformance with the approved grades or elevations.

3.11 ADDITIONAL MATERIAL

Where final grades above the pre-construction grades are required to maintain minimum cover, utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide additional suitable fill material.

3.12 BACKFILL WITHIN RIGHT-OF-WAYS

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

3.13 BACKFILL WITHIN GEORGIA DOT RIGHT-OF-WAY

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

3.14 FLOWABLE FILL

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

3.15 COMPACTED GRANULAR MATERIAL

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

3.16 TESTING AND INSPECTION

- A. The soils testing laboratory is responsible for compaction tests in accordance with paragraph 1.02 of this Section.

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

+++ END OF SECTION 02225 +++

**SECTION 02302
GRANITE CURB**

PART 1 GENERAL

1.01 SCOPE

- A. Work under this Section furnishing all labor, materials, equipment and incidentals required to install prefabricated granite curb, curb corners, transition curb and curb inlets.
- B. The Contractor shall also be responsible for removing and replacing existing granite curb.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents. In addition, the following specific information shall be provided:
 - 1. Two samples of finished product granite curb. Samples shall show anticipated color variations of grain structure, inclusions and other visual characteristics.
 - 2. No final cutting or finishing shall be done until the sample is submitted to City DWM and approved for use.

1.03 QUALITY ASSURANCE

Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.

- 1. ASTM C170 – Test Method for Compressive Strength of Dimension Stone
- 2. ASTM C615 – Standard Specification for Granite Dimension Stone
- 3. ASTM C880 – Test Method for Flexural Strength of Dimensional Stone

1.04 DEFECTIVE WORK

Any piece of granite showing manufacturing flaws or imperfections upon receipt on the job site shall be rejected by the Contractor, and immediately removed from the job site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Granite Curb

1. Stone curb shall be granite and shall comply with ASTM C615.
2. The granite shall be sound, durable and free from cracks or seams which impair its structural integrity and of a smooth splitting and machining character. The granite curb shall be approved granite curb and shall match exactly the existing curbs in color, texture and size.
3. Granite curb shall be not less than 3-feet or more than 8-feet in length, 16-inches in depth and matched width at the top or 6-inches wide.
4. Granite curb shall have a saw finish on the top with no projections or depressions greater than 1/8-inch.
5. The front of curb shall be split face and have a batter finished surface. The granite shall have no projections or depressions greater than 1/4-inch to grade line. The remainder of the face shall be free from projections greater than 1-inch.
6. The back of the curb shall be parallel to the face and shall have no projections or depressions which exceed a batter of 1-inch in 3-inches from the top.
7. The ends for the full width of the stone curb shall be close jointed, square to the top and face. The remainder of the end shall be cut so that there will be a close joint.
8. The bottom of the stones shall be square.

B. Concrete: Concrete shall be 3000 psi as specified in Section 03300.

PART 3 EXECUTION

3.01 SETTING GRANITE CURB

- A. Curb trenches shall be opened to their full width and depth well in advance of the setting of the curb. The foundation for the curb shall be concrete. The bottom layer of concrete shall be 6-inches thick. The concrete in front and back of the curb shall be deposited simultaneously to the required height.
- B. Curb shall be set with close joints. The top front edge of the curb shall present an unbroken line and the face a plane surface with a batter of 1 to 12.

- C. The curb at the corners of intersecting joints shall be of the same quality as the curb hereinbefore specified and shall be set in the same manner. On curbs, where drainage inlets are located, special shaped stones as may be required shall be furnished and set. At wheelchair ramps and wherever required, transition curb shall be furnished and set.

3.02 REMOVING AND REINSTALLING EXISTING GRANITE CURB

- A. In locations where existing granite curb conflicts with pipe installation and hydrant removal and replacement, the Contractor shall remove the existing curb.
- B. The City DWM will determine whether any granite curb that removed is acceptable for reinstallation.
- C. Removed curb approved for reinstallation shall be cleaned and stored by the Contractor until reinstallation.
- D. Reinstallation of curb shall include saw cutting the existing pavement a minimum of 1-inch, removing pavement to subgrade, excavation of base and subgrade as necessary to install the curb, installing the curb and backfilling and compacting the completed installation.
- E. Any curb that is damaged, which renders it unsuitable for reinstallation, shall be removed from the site and be replaced with new curb by the Contractor.

+++ END OF SECTION 02302 +++

**SECTION 02371
GREEN INFRASTRUCTURE GEOTEXTILES**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

Section includes furnishing and installation of geotextile for layer separation and filtration in stormwater quality facilities including subsurface drainage and infiltration features. This section does not include geotextiles for subgrade stabilization.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

AASHTO M288, Geotextile Specification for Highway Applications

B. ASTM International:

1. ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing
2. ASTM D 4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
3. ASTM D 4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
4. ASTM D 4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles
5. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
6. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
7. ASTM D 4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
8. ASTM D 6241, Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

1.03 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the Contract.

- B. Submit the following for review prior to shipment of geotextile products to the Site:
 - 1. Manufacturers' descriptive documentation (including material properties sheets) for each product.
 - 2. Sample of each geotextile product.
- C. Submit the following for review at time of shipment of each product:

The manufacturers' quality control certifications (including results of source quality control testing of the products as specified in subsection 2.01) to verify that the materials supplied for the project are in compliance with all product specifications in this Section. The certifications shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers, and corresponding shipping information.

1.04 QUALITY ASSURANCE

- A. Installer's Qualifications: The geotextile installer shall have successfully installed at least 5,000 square feet of geotextile in a similar application on at least two separate projects.
- B. Manufacturer's Qualifications: The manufacturer(s) shall have at least five years experience in the manufacture of geotextiles of the type specified.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Product rolls shall be marked or tagged with manufacturer's name, product identification, lot number, roll number, and roll dimensions.
- B. Procedures for storage and handling of geotextile shall conform to ASTM D 4873 and the manufacturer recommendations, including the following:
 - 1. Continuously and uniformly support rolls on a prepared surface elevated above grade away from traffic areas. Cover rolls with tarp for protection from sun, dirt and other deleterious conditions if the protective wrap around the geotextile is damaged.
 - 2. No hooks, tongs, or other sharp instruments shall be used for handling the geotextile. Geotextile rolls shall not be lifted by use of cables or chains in contact with the products.

- C. Geotextile shall be inspected upon delivery and during installation. Geotextile that is damaged to the extent that it is no longer usable shall be removed from the Site and replaced with new material.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Quality control testing of each geotextile product shall be performed by the manufacturer prior to shipment in accordance with ASTM D 4354.
- B. For manufacturer's quality control testing of each geotextile product, the sample average test results (weaker principle direction for mechanical tests) for a particular property for any individual roll tested within a lot designated as first quality shall meet or exceed the Minimum Average Roll Value indicated in the manufacturer's certification.

2.02 GEOTEXTILE PRODUCTS

- A. All geotextile products shall be resistant to ultraviolet degradation and biological and chemical environments normally found in soils.
- B. Geotextile to be installed as separation geotextile (such as in subsurface drainage trenches, and between aggregate and soil at other indicated locations) shall be a continuous filament polypropylene nonwoven needle-punched fabric, Survivability Class 1 (as defined in AASHTO M 288), meeting or exceeding the following specifications:

Property	Test Method	Test Value⁽¹⁾
Grab Tensile Strength	ASTM D 4632	230 lb
Grab Tensile Elongation	ASTM D 4632	50 %
Trapezoid Tear Strength	ASTM D 4533	95 lb
Puncture (CBR) Strength	ASTM D 6241	600 lb
Permittivity ⁽²⁾	ASTM D 4491	1.4 sec ⁻¹
AOS ⁽³⁾	ASTM D 4751	0.15 mm (max.)
Ultraviolet Resistance (% strength retained at 500 hours)	ASTM D 4355	80 %

Notes:

⁽¹⁾ Minimum Average Roll Value (unless otherwise noted) in weakest principal direction

⁽²⁾ Allowable permittivity is to be specified based on grain size analysis of *in situ* subgrade soils in accordance with AASHTO M288.

⁽³⁾ Allowable apparent opening size (AOS) is to be specified based on grain size analysis of *in situ* subgrade soils in accordance with AASHTO M288.

- C. Geotextile to be installed for subgrade stabilization or for use as part of a permeable pavement system shall be specified as part of the pavement section design.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare subgrade for geotextile as specified in applicable sections.
- B. Surfaces to receive geotextile shall be free of litter, sharp protrusions, and large stones.

3.02 GEOTEXTILE INSTALLATION

- A. Geotextile shall not be deployed until the required submittals specified in subsection 1.03 are submitted to City DWM. If the material does not meet project specifications, it shall be removed at no additional cost to the Project.

- B. Geotextile shall be placed and installed in such a manner that placement of overlying material will not excessively stretch or tear the geotextile. Anchor geotextile as necessary to prevent wind uplift and displacement by other causes.
- C. Place nonwoven geotextile on the prepared sides of trenches and other indicated areas for separation and filtration at the required locations and to the required limits.
- D. Overlapping of adjacent panels without seaming will be allowed for installation of geotextile unless otherwise specified. Overlaps of adjacent rolls of geotextile and at the top of gravel backfill shall be approximately one foot.
- E. On curves, the geotextile may be folded or cut to conform to the curves. Folds and overlaps shall be shingled in the direction of construction or downslope, as applicable.
- F. Where indicated, geotextile shall be joined by seaming as specified in the following paragraphs.
 - 1. Geotextile required to be seamed shall be overlapped and sewn along the entire length of joints in accordance with manufacturer's recommendations, and sufficient to prevent opening of seams by wind action or soil deployment.
 - 2. Seams shall be continuously sewn, unless otherwise recommended by the manufacturer.
 - 3. The minimum distance from the geotextile edge to the stitch line nearest the edge shall be three inches, unless otherwise recommended by the manufacturer.
 - 4. The thread at the end of each seam run shall be tied off to prevent unraveling. Seams shall be on the top side of the geotextile to allow inspection.
 - 5. Discontinuities over six inches in length shall be sewn with an extra line of stitching, with 18 inches of stitch overlap.
- G. Bury the upper edges of geotextile a minimum of six inches below grade at outer edges of installed material.

3.03 PLACEMENT OF COVER MATERIALS

- A. Cover geotextile as soon as possible after installation and approval. Installed geotextile shall not be left exposed for more than 7 days.

- B. At no time, shall construction equipment come into direct contact with the installed geotextile. Damage to geotextile shall be repaired as specified in subsection 3.04 prior to placement of cover material.
- C. Place the required cover material specified in other sections and to the thickness and limits required.
- D. At least a 12-inch thick layer of cover material shall be maintained between placement equipment and installed geotextile when spreading the material. Unless otherwise specified, place the material using lightweight tracked equipment which will produce maximum loads not greater than eight pounds per square inch.
- E. Use care in placing the cover material to avoid damaging or displacing geotextile. Any damage to the geotextile caused by the Contractor's activity shall be repaired.

3.04 GEOTEXTILE REPAIR

- A. Holes or tears in the geotextile shall be repaired with a patch of the same material, unless otherwise recommended by the manufacturer.
- B. Geotextile patches shall be sized to cover a minimum of two feet beyond the limits of the damaged area in all directions.

+++ END OF SECTION 02371 +++

**SECTION 02521
CONCRETE SIDEWALKS, CURBS AND GUTTERS**

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for construction of concrete sidewalks, concrete monolithic sidewalk and curb, concrete header curb, concrete curb, concrete gutter and concrete combined curb and gutter, which shall consist of monolithic curb and gutter respectively, all constructed of Portland cement concrete, at the locations, and to the lines, grades, cross section, form and dimensions required.
- B. Cement concrete sidewalks, concrete monolithic sidewalk and gutter, concrete header curb, concrete curb, concrete curb, gutter and combined curb and gutter shall include all necessary excavation, unless otherwise indicated, and subgrade preparation; backfilling, and final clearing up; and completion of all incidentals thereto, as required.

1.02 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect concrete materials before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the City DWM.

1.03 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

Concrete reinforcement shall conform to Section 03200.

2.02 CONCRETE AND RELATED MATERIALS

- A. General: Concrete and related materials including, but not necessarily limited to, joint materials, membranes and curing compounds shall conform to Section 03300.
- B. Class: All concrete shall be Class B 3,000 psi and conform to requirements of Section 03300.

- C. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, wastewater and/or organic matter.
- D. Admixtures shall meet the following requirements:
 - 1. Except as herein specified, no curative or hardening admixtures shall be used.
 - 2. An air entrainment agent capable of providing 3 to 6 percent air shall be used. Air entraining admixtures which are added to concrete mixtures shall conform to ASTM C 260 for Air Entraining Admixtures for Concrete.
- F. Sub-base shall be constructed of durable material such as bank-run gravel. Minimum depth of sub-base shall be 3-inches.
- G. Joint filler shall be a non-extruding joint material conforming to AASHTO M21 3 for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types). The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint

PART 3 - EXECUTION

3.01 EARTHWORK

- A. General: All earthwork shall be performed in accordance with Section 02200 and as specified in this Section.
- B. Backfilling
 - 1. After the subgrade for sidewalks is compacted and at the proper grade, spread 3 inches or more of sub-base material. Sprinkle with water and compact by rolling or other acceptable and approved method. Top of the compacted gravel shall be at the proper level to receive the concrete.
 - 2. After the concrete has set sufficiently, the spaces on both sides of the curb, gutter, and combined curb and gutter shall be backfilled, and the materials compacted and left in a neat and workmanlike condition.
 - 3. Curbs to be used in the construction of asphalt pavements shall be backfilled prior to placement of base material for asphalt pavement.

3.02 SUBGRADE PREPARATION

The subgrade shall be formed by excavating to the required depth below the finished surface of the respective types, in accordance with the approved dimensions and designs, and shall be of such width as to permit the proper installation and bracing of forms. The subgrade shall

be compacted by hand tamping and all soft, yielding or unsuitable material shall be removed and backfilled with satisfactory material and again compacted thoroughly to 98% of dry density per ASTM 698 and finished to a smooth and unyielding surface. The finished grade shall be to the approved dimensions and design.

3.03 CONCRETE CURB AND GUTTER CONSTRUCTION

- A. Construct curbs to lines and grade. Curbs shall conform to City standards.
- B. Forming:
 - 1. Forms shall be metal. They shall be straight, free from distortions, and shall show no vertical variation greater than 1/4-inch in 10 feet, and shall show no lateral variation greater than 1/4-inch in 10 feet from the true plane surface on the vertical face of the form.
 - 2. Forms shall be of the full depth of the structure and be so constructed as to permit the inside forms to be securely fastened to the outside forms.
 - 3. Securely hold forms in place true to the lines and grades indicated on the Drawings.
 - 4. Wood forms may be used on sharp turns and for special sections as approved by the Engineer.
 - 5. Where wooden forms are used, they shall be free from warp and the nominal depth of the structure.
 - 6. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
 - 7. The supply of forms shall be sufficient to permit their remaining in place at least 12 hours after the concrete has been placed.
- C. Joints:
 - 1. Joints shall be constructed in accordance with City standards and industry practice.
 - 2. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
 - 3. Thoroughly spade and compact the concrete at the faces of all joints to fill all voids.
 - 4. Install expansion joint materials at the point of curve at all street returns.

5. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
6. Place contraction joints every 10 feet along the length of the curbs and gutters.
7. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place.
8. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or shall be notched to permit the reinforcement to be continuous through the joint.
9. Contraction joints shall be a minimum of 1-1/2-inches deep.

D. Finishing:

1. Strike off the surface with a template, and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius required by City standards.
3. Finish edges with an approved finishing tool having a 1/4-inch radius.
4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.

E. Concrete Curing:

1. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound specified in Section 03300.
2. The compound shall be applied in one or two applications as directed by the Engineer. When the compound is applied in two (2) increments, the second application shall follow the first application within 30 minutes.
3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer at an acceptable rate, but not less than 1 gallon per

200 square feet of surface.

4. The equipment shall provide adequate stirring of the compound during application.
5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the Engineer.

F. Protection:

1. Provide and use sufficient coverings for the protection of the concrete in case of rain or breakdown of curing equipment.
2. Provide necessary barricades and lights to protect the work and rebuild or repair. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor at no additional expense to the City DWM.

3.04 SIDEWALK CONSTRUCTION

A. Sidewalks shall be 4 inches thick.

B. At locations where the new sidewalk is to abut existing concrete, sawcut concrete for a depth of 2 inches and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk.

C. Joint:

1. Place preformed asphalt expansion joints as in the adjacent curb, where the sidewalk ends at the curb, and around posts, poles, or other objects protruding through the sidewalk.
2. Provide contraction joints transversely to the walks at locations opposite the construction joints in the curb. These joints shall be straight and at right angles to the surface of the walk.

D. Finishing:

Broom the surface with a fine-hair broom at right angles to the length of the walk and tool all edges, joints, and markings. Mark the walks transversely with a jointing tool.

E. Concrete Curing

1. After the finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated

and sealed with a uniform layer of curing compound specified in Section 03300.

2. The compound shall be applied in one or two applications as directed by the Engineer. When the compound is applied in two (2) increments, the second application shall follow the first application within 30 minutes.
3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer at an acceptable rate, but not less than 1 gallon per 200 square feet of surface.
4. The equipment shall provide adequate stirring of the compound during application.
5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method

F. Protection:

1. Protect the sidewalks from damage for a period of seven days.
2. All damage caused by people, vehicles, rain, animals and the Contractor, shall be repaired by the Contractor at no additional expense to the City DWM.

3.05 REPLACEMENT CONCRETE CURB AND SIDEWALK

- A. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at a location determined in the field with City DWM approval.
- B. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surfaces of the new work shall form an even, unbroken plane with the existing surfaces.
- C. All work shall conform to the requirements for new sidewalks and curbs as detailed in this Section.

3.06 CLEANING

- A. All excess or unsuitable material shall be disposed of as specified in **Section 02050, Demolition.**

- B. All surfaces of the Work and adjacent surfaces shall be broom clean. Contractor shall use pressure washing and other means to remove splashed and spilled concrete from the Work and adjacent surfaces.
- C. Disturbed seeded areas shall be reseeded per requirements of Section 02933.

+++ END OF SECTION 02521 +++

**SECTION 02535
REINFORCED CONCRETE STORM DRAIN PIPE**

PART 1 – GENERAL

1.01 SCOPE

The Contractor shall furnish all labor, materials, equipment and incidentals required to install all reinforced concrete storm drain pipe.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM as part of the Project record:
1. Product Data: Descriptive details and shop drawings covering full details of pipe, fittings, specials, joints and the assembly thereof, joint materials and details thereof, and full details and cuts of all castings to be incorporated into the Work.
 2. Manufacturer's Installation Instructions: Special procedures required to install products specified.
 3. Manufacturer's Certificate: A manufacturer's certificate certifying that products meet or exceed specified requirements.
- B. Submit shop drawings to the City DWM showing a complete laying plan of all pipe, including all fittings, adapters, and specials along with the manufacturer's drawings and specifications indicating complete details of all items. The pipe details shall include stationing, pipe class or design and supporting computations; and laying schedule which specifies pipe class, class coding, pipe stationing for all changes in grade or horizontal alignment, transition stations for various pipe classes and the limits of each.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
1. ASTM C33 – Specification for Concrete Aggregate
 2. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 3. ASTM C150 – Standard Specifications for Portland Cement

4. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes using Rubber gaskets
5. ASTM C655 – Standard Specifications for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
6. ASTM C1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.
7. ASTM C1619 – Standard Specification for Elastomeric Seals for Joining Concrete Structures

1.04 TRANSPORTATION AND HANDLING

- A. Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.
- B. Handle pipe, fittings and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift or front loader. Do not use material damaged in handling.

1.05 STORAGE AND PROTECTION

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.
- C. Pipe shall be stored per the manufacturer's recommendations.
- D. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

1.06 ACCEPTANCE

- A. Acceptance of pipe shall be on the basis of plant load-bearing tests of the pipe, material tests and inspection of manufactured pipe for visual defects and imperfections as described in paragraph 5.1.1 of ASTM C76.
- B. All pipe shall be manufactured in accordance with the American Concrete Pipe Association QCast Storm Sewer quality assurance program. If pipe producer is not QCast certified, each length of pipe shall be stamped by a regular employee of an approved testing agency.

- C. If producer is not QCast certified, provide results of tests on pipe, pipe materials, joint material, and made-up joints by an independent testing laboratory. Include materials, absorption, crushing and hydrostatic leakage tests on pipe of each size in accordance with applicable specifications.
- D. Inspect pipe after delivery for QCast or laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, hammer test, damaged ends and gasket grooves. Any pipe repaired or patched is subject to rejection if such repairs or patches are not sound and properly finished.
- E. Pipe shall not be shipped until it has attained full specified 28 day compressive strength.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All reinforced concrete storm drain pipe shall conform to the requirements ASTM C76, except as specifically extended, modified or amended in this section.
- B. All reinforced concrete storm drain pipe shall meet the standards for ASTM C76 Class III. All reinforced concrete storm drain pipe shall have a minimum of a B wall thickness.

2.02 CONCRETE PIPE

- A. Reinforced concrete storm drain pipe shall be manufactured in accordance with ASTM C76 and shall be furnished in not less than eight (8) foot lengths. Special pieces and closure pieces may be of shorter lengths than specified in this section. Pipe shall be manufactured wet cast, dry cast, or centrifugally cast.
- B. No lifting holes shall be provided in the wall of the pipe. Care shall be exercised in handling and transporting the pipe so as to protect the full interior wall of the pipe. No inward projecting hooks or lift bars shall be used in lifting pipe. Extreme care shall be applied to handling pipe immediately after manufacture to prevent development of "cure" cracks and stress cracks due to transporting pipe before full length of curing time.
- C. All reinforced concrete storm drain pipe shall be made with concrete with a twenty eight (28) day minimum compressive strength of 4000 psi and the absorption shall not exceed nine (9) percent. All cement and aggregate shall conform to the requirements of ASTM C76. Coarse aggregate shall meet the requirements of ASTM C33 of a size that provides a workable homogeneous, high quality concrete mixture, considering the particular wall thickness. Cement, for reinforced concrete pipe, shall be Type I/II Portland cement. The requirements of this article shall apply to all

reinforced concrete pipe manufactured under the requirements of ASTM C76 and ASTM C443.

- D. Reinforcement shall consist of either wire conforming to the standard specification for deformed steel wire for concrete reinforcement (ASTM A496), welded deformed steel wire fabric for concrete reinforcement (ASTM A497), bars of intermediate grade steel conforming to standard specifications for billet steel bars for concrete reinforcement (ASTM A615, Grade 60) or from fabricated deformed steel mats for concrete reinforcing (ASTM A184). Steel areas shall be in accordance with ASTM C76. Pipe with a diameter of 42-inches and larger shall be reinforced with two (2) full circular steel cages. Elliptical steel cages or quadrant steel cages shall not be allowed. Reinforcing steel shall be positioned in accordance with the clearances specified in ASTM C76. Clearance shall be provided for the full length of the pipe from bell end to spigot end of the pipe. Steel positioning shall not vary within the forms more than +/-10% of the wall thickness or +/-one-half (1/2)-inch, whichever is greater.
- E. Variations of the internal diameter of the pipe shall comply with paragraph 12.1 of ASTM C76. The planes of the ends of the pipe shall be perpendicular to the longitudinal axis of the pipe except as specified for beveled end pipe (special pieces below). The ends of the pipe shall be of such a design that the pipe, when laid, shall form a continuous conduit with smooth and uniform interior surface. Minor repairs to the pipe are allowed as outlined in accordance with ASTM C76. Minor repairs made at the point of manufacture or in the field shall be filled with a permanent non-shrinking patching compound. Mortar patching compound shall be similar and equal to Embecco 167 Mortar as manufactured by Master Builders, Thoropatch as manufactured by Thoroseal Products, or equal. The QCast Inspector shall inspect the lengths of pipe before they are shipped to the project site and shall require the manufacturer to apply the mortar as directed. No mortar shall be applied without prior approval of the QCast Inspector.
- F. A record of pipe supplied for the project shall be furnished to the City DWM by the manufacturer. All pipe shipped to the site of the Work shall be clearly marked as to type, date of manufacture, and name or trademark of manufacturer. The historical record of pipe supplied shall contain: class, date of manufacture, dates of inspection, date of shipment, and dates and results of compressive tests on cylinders and cores.
- G. The Contractor shall not unload the pipe from trucks at the site of the Work in a manner that might damage the pipe. It shall be the responsibility of the Contractor to assure that the pipe is manufactured, loaded, transported, unloaded, stored, and installed in a manner which does not result in damage to the pipe.
- H. The Contractor reserves the right to reject any and all pipe until it meets all the requirements of these specifications.

2.03 SPECIAL PIECES

Special pieces of pipe such as bends shall be manufactured from cut lengths of straight pipe, and shall have carry-over reinforcement across adjoining planes in accordance with industry standards.

2.04 JOINTS

All joints and gaskets shall meet the requirements of ASTM C443.

2.05 SPECIAL DESIGN PIPE

- A. Special designs of reinforced concrete pipe shall be in accordance with the requirements of ASTM C76 Section 7.2 - modified or special designs.
- B. The pipe manufacturer shall not manufacture reinforced concrete pipe, test pipe, or produce pipe until approval has been obtained from the Contractor in writing. The manufacture of pipe shall have concrete cover over the inside steel cage and cover over the outside steel cage, in accordance to ASTM C76 standards, shall provide two complete circular mats of steel, and shall provide the strengths of steel as specified in this section. Pipe shall be designed per applicable sections of ASTM C76.
- C. The pipe manufacturer shall be required upon receiving the order from the Contractor to submit to the Contractor and City DWM as part of the project record, the design for the classes of pipe to be manufactured. Manufacturing drawings shall be required for each pipe size and pipe class. The drawings shall be working drawings to reflect sizes of steel (circumferential, longitudinal, spacer, and stirrups steel) as well as steel placement.
- D. Submission of certified three-edge-bearing tests already made may be considered as verification of Special Design in lieu of D-Load tests.
- E. The City DWM may select at random two full length joints of each class or size of pipe to be tested to D-loads that would produce applicable (ASTM C76) cracking. Tests shall be in accordance with applicable sections of ASTM C76 or as amended in this section. The test shall be performed in the presence of the QCast inspector.

PART 3 – EXECUTION

3.01 LAYING CONCRETE PIPE

- A. Excavation for the pipe and preparation of the trench bottom, including bedding to receive the pipe, shall be done in accordance with the requirements of Section 02225. In the preparation of the pipe bedding, the Contractor shall take into consideration any variation in thickness of the pipe wall, and the bed must be prepared to suit the particular piece of pipe to be lowered into place. Preparation of the compacted bed

shall be such that when the pipe is lowered in place and pulled to secure full compressive pack of the rubber joint ring, a smooth and uniform flow line on the specified grades will be secured. An interior inspection of the sewer will be made after sufficient time has elapsed for the backfill to attain its settlement in the trench.

- B. The pipe interior and joints shall be clean when lowered in the trench and shall be kept clean thereafter. The exposed ends of pipe in the trench shall be closed by suitable bulkheads at all times when pipe laying is not in progress. Each section of pipe shall be securely anchored in place before the next adjoining pipe is laid and the joint between the sections is made.
- C. No tools or equipment shall be used in the laying of the pipe that will damage the pipe. The trenching equipment shall not be used to force a joint of pipe into its proper position on grade by application of pressure on top of the pipe along its partial or full length. All pipe joints shall be brought home by use of properly designed equipment for the specific purpose in accordance with industry standards. Pipe lengths that have received damage to wall, spigot, or socket shall be replaced or repaired to the satisfaction of the Contractor. Such replacement or repair shall be at the Contractor's expense.
- D. The Contractor shall secure the following results with the pipe and joint used:
 - 1. A tight joint with gasket fully compressed and joint openings completely filled.
 - 2. Pipeline shall have a smooth and uniform interior section free from cracks, pits, voids, or crazing as defined in Sections 13 and 15 of ASTM C76. Longitudinal and transverse cracks with a width less than 0.01-inch shall be considered hairline and minor. Seal longitudinal and transverse cracks having a width equal to or greater than 0.01-inch and less than 0.10-inch if there is displacement across the crack and the soil pH is less than 5.5. Replace pipes having longitudinal and transverse cracks greater than 0.10-inch.
- E. Backfilling shall be in accordance with the requirements of Section 02225.

3.02 CLEANING

At the conclusion of the work, the Contractor shall clean all pipe by flushing with water or other means to remove all dirt, stone wood or other materials which may have entered the pipe during construction.

3.03 TESTING

Additional testing and inspection required for acceptability of installed storm sewers is specified in Section 02650.

3.04 CLEANUP

After completing each section of storm drain, the Contractor shall remove all debris and construction materials and equipment from the site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean and neat condition. The Contractor shall restore the site of the Work to its original or better condition.

+++ END OF SECTION 02535 +++

SECTION 02536
REINFORCED CONCRETE SANITARY SEWER PIPE

PART 1 GENERAL

1.01 SCOPE

The Contractor shall furnish all labor, materials, equipment and incidentals required to install and test all reinforced concrete sanitary sewer pipe.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM for information as part of the Project record:
1. Product Data: Descriptive details and shop drawings covering full details of pipe, fittings, specials, joints and the assembly thereof, joint materials and details thereof, and full details and cuts of all castings to be incorporated into the Work.
 2. Manufacturer's Installation Instructions: Special procedures required to install products specified.
 3. Manufacturer's Certificate: A Manufacturer's Certificate certifying that products meet or exceed specified requirements.
- B. Submit to City DWM for informational purposes a complete laying plan of all pipe, including all fittings, adapters, and specials along with the manufacturer's drawings and specifications indicating complete details of all items. The pipe details shall include stationing, pipe class or design and supporting computations; and laying schedule which specifies pipe class, class coding, pipe stationing for all changes in grade, transition stations for various pipe classes and the limits of each.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
1. ASTM C33 – Standard Specification for Concrete Aggregate
 2. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
 3. ASTM C150 – Standard Specifications for Portland Cement

4. ASTM C655 – Standard Specifications for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
5. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
6. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
7. ASTM C1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.
8. ASTM C1619 – Standard Specification for Elastomeric Seals for Joining Concrete Structures
9. ASTM C1628 - Standard Specifications for Reinforced Concrete Low-Head Pressure Pipe.

1.04 TRANSPORTATION AND HANDLING

- A. Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.
- B. Handle pipe, fittings and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.

1.05 STORAGE AND PROTECTION

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.
- C. Pipe shall be stored per the manufacturer's recommendations.
- D. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

1.06 ACCEPTANCE

- A. Acceptance of pipe shall be on the basis of plant load-bearing tests of the pipe, material tests and inspection of manufactured pipe for visual defects and imperfections as described in paragraph 5.1.1 of ASTM C76.
- B. All pipe shall be manufactured in accordance with the American Concrete Pipe Association QCast Sanitary Sewer quality assurance program. If pipe producer is not QCast certified, each length of pipe shall be stamped by a regular employee of an approved testing agency.
- C. If producer is not QCast certified, provide results of tests on pipe, pipe materials, joint material, and made-up joints by an independent testing laboratory. Include materials, absorption, crushing and hydrostatic leakage tests on pipe of each size in accordance with applicable specifications.
- D. Inspect pipe after delivery for QCast or laboratory stamp, shape, cracks, uniformity, blisters and imperfect surfaces, hammer test, damaged ends and gasket grooves. Any pipe repaired or patched is subject to rejection if such repairs or patches, in accordance with industry standards, are not sound and properly finished.
- E. Pipe shall not be shipped until it has attained full specified 28-day compressive strength. Full compressive strength shall be confirmed by passing the 3-edge bearing test for 0.01-inch crack strength for pipes 54-inches in diameter or less or passes the cylinder bursting test for cores if pipe 60-inches in diameter or greater per ASTM C76.

PART 2 PRODUCTS

2.01 GENERAL

- A. All reinforced concrete sanitary sewer pipe shall conform to the requirements ASTM C76, and ASTM C1628, except as specifically extended, modified, or amended in this section.
- B. All reinforced concrete sanitary sewer pipe shall meet the standards for ASTM C76 Class III. All reinforced concrete sanitary sewer pipe shall have a minimum of a B wall thickness.

2.02 CONCRETE PIPE

- A. Reinforced concrete sanitary sewer pipe shall be manufactured in accordance with ASTM C76 and ASTM C1628 and shall be furnished in not more than sixteen (16) foot lengths and not less than eight (8) foot lengths. Special pieces and closure pieces may be of shorter lengths than specified in this section. Pipe shall be manufactured wet cast, dry cast, or centrifugally cast.
- B. No lifting holes shall be provided in the wall of the pipe. Care shall be exercised in handling and transporting the pipe so as to protect the full interior wall of the pipe. No inward projecting hooks or lift bars shall be used in lifting pipe. Extreme care shall be applied to handling pipe immediately after manufacture to prevent development of "cure" cracks and stress cracks due to transporting pipe before full length of curing time.
- C. All reinforced concrete pipe shall be made with concrete with a twenty eight (28) day minimum compressive strength of 4000 psi and the absorption shall not exceed nine (9) percent. All cement and aggregate shall conform to the requirements of ASTM C76. Coarse aggregate shall meet the requirements of ASTM C33 of a size that provides a workable homogeneous concrete mixture, considering the particular wall thickness. Cement shall be Type I/II Portland cement with a maximum C₃A content of eight (8) percent and a water-cement ratio not exceeding 0.43 by weight. All admixtures shall be in accordance with industry standards.
- D. Submit the proposed concrete design mix to the City DWM as part of the Project record. The requirements of this article shall apply to all reinforced concrete pipe manufactured under the requirements of ASTM C76, and ASTM C1628.
- E. Reinforcement shall consist of either wire conforming to the standard specification for deformed steel wire for concrete reinforcement (ASTM A496), welded deformed steel wire fabric for concrete reinforcement (ASTM A497), bars of intermediate grade steel conforming to standard specifications for billet steel bars for concrete reinforcement (ASTM A615, Grade 60), or fabricated deformed steel mats for concrete reinforcing (ASTM A184). Steel areas shall be in accordance with ASTM C76. Pipe with a diameter of 42-inches and larger shall be reinforced with two (2) full circular steel cages. Elliptical steel cages or quadrant steel cages shall not be allowed. Reinforcing steel shall be positioned in accordance with the clearances specified in ASTM C76. Clearance shall be provided for the full length of the pipe from bell end to spigot end of the pipe. Steel positioning shall not vary within the forms more than +/-10% of the wall thickness or +/-one-half (1/2)-inch, whichever is greater.
- F. Variations of the internal diameter of the pipe shall comply with paragraph 12.1 of ASTM C76. The planes of the ends of the pipe shall be perpendicular to the longitudinal axis of the pipe except as specified for beveled end pipe (special

pieces below). The ends of the pipe shall be of such a design that the pipe, when laid, shall form a continuous conduit with smooth and uniform interior surface. Minor repairs to the pipe shall be allowed as specified in ASTM C76. Minor repairs made at the point of manufacture or in the field shall be filled with a permanent non-shrinking patching compound.

- G. Mortar patching compound shall be similar and equal to Tembec 167 Mortar as manufactured by Master Builders, Thoropatch as manufactured by Thoroseal Products, or approved equal. The QCast Inspector shall inspect the lengths of pipe before they are shipped to the project site and shall require the manufacturer to apply the mortar as directed. No mortar shall be applied without prior approval of the QCast Inspector.
- H. A record of pipe supplied for the project shall be furnished to the City DWM by the manufacturer. All pipe shipped to the site of the Work shall be clearly marked as to type, date of manufacture, and name or trademark of manufacturer. The historical record of pipe supplied shall contain: piece number of pipe, schedule number in line, class, date of manufacture, dates of inspection, date of shipment, and dates and results of compressive tests on cylinders and cores.
- I. The City DWM, in accepting the pipe, does not imply that the pipe is acceptable for its intended use. The City DWM reserves the right to reject any and all pipe until it meets all the requirements of these specifications.

J. The following sulfide resistant options shall be incorporated in the concrete mix design as warranted by the project conditions and confirmed by the Contractor:

1. Sulfide Resistant Additive

- a. Where specified, a sulfide resistant additive shall be added to the concrete mix. The sulfite resistant additive shall permeate the concrete during the mixing phase and molecularly bond to the cement particles to become an integral component of the hardened concrete product and create an environment incompatible to thiobacillus bacteria growth and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid.
- b. When the additive is used, it shall be introduced into the concrete mix at the pipe manufacturing facility, with one gallon of the additive replacing one gallon of water in each cubic yard of concrete produced.
- c. The Contractor shall include provisions in his Quality Control Plan to coordinate with the pipe manufacturer to verify that the additive is placed in the concrete mix in the proper amount on a uniform and consistent basis for all reinforced concrete sanitary sewer pipe produced for this Project requiring the additive.

- d. When the additive is used, the pipe manufacturer shall be required to provide special markings on each pipe section designating it a “special design for the City of Atlanta, containing Sulfide Resistant Additive”. The manufacturer may also use a dye in the concrete mix to give the finished pipe section a unique color.
- e. The sulfide resistant additive shall be Con^{MIC}Shield[®], supplied by Vermillion and Associates, Chattanooga, Tennessee, or approved equal.

2. Sulfide Resistant Limestone Aggregate

- a. When used, the limestone aggregate shall permeate the concrete during the mixing phase and molecularly bond to the concrete particles to become an integral component of the hardened concrete product and create an environment incompatible to thiobacillus bacteria growth and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria interacting with the hydrogen sulfide gas and producing sulfuric acid.
- b. All reinforced concrete pipe shall be made with concrete with a minimum compressive strength per ASTM C76 and the absorption shall not exceed nine (9) percent. All cement and aggregate shall conform to the requirements of ASTM C76. Coarse aggregate shall be well graded limestone of a size that provides a homogenous concrete mixture, considering the pipe wall thickness. Fine aggregate shall consist of graded limestone sand, limestone screenings or natural sand that provides a homogenous concrete mixture, considering the pipe wall thickness.
- c. The minimum alkalinity of the hardened concrete, as determined by ASTM C497, shall not be less than 50% expressed as calcium carbonate (CaCO₃). Cement for pipe shall be Type I, Type II or Type I/II Portland cement.
- d. All admixtures shall be in accordance with industry standards. The manufacturer shall submit the proposed concrete design mix with the estimated finished concrete alkalinity to the City DWM as part of the Project record. The requirements of this article shall apply to all reinforced concrete pipe manufactured under the requirements of ASTM C76.

3. Sulfide Resistant Coatings

- a. When used, all sulfide resistant coatings shall provide an impenetrable bond to the hardened surface of the concrete pipe. The coating shall prevent the bacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid on the surface of the concrete wall of the pipe.

- b. When a coating is used, it shall be applied at the concrete manufacturing facility, tested and inspected in accordance with the coating manufacturer's specifications. Specifications shall be submitted to the City DWM prior to use.
- c. The sulfide resistant coating shall be a polyurea elastomer coating or approved equal.

4. Sulfide Resistant Liners

- a. When used, all sulfide resistant liners shall be concrete poured against the lining and vibrated and compacted in a manner to protect the lining and to produce a dense homogenous concrete, securely anchoring the lining locking extensions into the concrete in accordance with the liner manufacturer's specifications. Liner shall create an environment incompatible to thiobacillus growth, and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid.
- b. When a liner is used, it shall be installed at the concrete manufacturing facility, inspected and tested in accordance with the lining manufacturer's specifications. Liner joints shall be field welded in accordance with the liner manufacturer's recommendations.
- c. The sulfide resistant liner shall be Agru America HDPE Sure Grip Liner, GSE StudLiner, Ameron T-Lock Liner, or approved equal.

2.03 SPECIAL PIECES

- A. Special pieces of pipe such as bends shall be manufactured from cut lengths of straight pipe, and shall have carry-over reinforcement across adjoining planes in accordance with industry standards.
- B. Manhole pieces shall be manufactured as required.

2.04 CONCRETE AND RUBBER JOINTS

- A. All joints and gaskets shall meet the requirements of ASTM C1628.
- B. Specific joint dimensions shall be submitted to the City DWM as part of the Project record.

2.05 SPECIAL PIPE DESIGN

- A. Special designs of reinforced concrete pipe shall be in accordance with the requirements of ASTM C76 Section 7.2 - modified or special designs.

- B. The manufacture of pipe shall have concrete cover over the inside steel cage and cover over the outside steel cage, in accordance to ASTM C76 standards, shall provide two complete circular mats of steel, and shall provide the strengths of steel as specified in this section. Pipe shall be designed per applicable sections of ASTM C76.
- C. The pipe manufacturer shall be required upon receiving the order from the Contractor to submit to the City DWM the design for the classes of pipe to be manufactured. Manufacturing drawings shall be required for each pipe size and pipe class. The drawings shall be working drawings to reflect sizes of steel (circumferential, longitudinal, spacer, and stirrups steel) as well as steel placement.
- D. Submission of certified three-edge-bearing tests already made may be considered as verification of special pipe design in lieu of D-Load tests.
- E. The City DWM may select at random two full length joints of each class or size of pipe to be tested to D-loads that would produce applicable (ASTM C76) cracking. Tests shall be in accordance with applicable sections of ASTM C76 or as amended in this section. Upon completion of said D-load test procedures, the joints of pipe tested that meet the applicable crack test shall be treated for the full length with epoxy coating in accordance with industry standards. The test shall be performed in the presence of the QCast Inspector.

PART 3 EXECUTION

3.01 LAYING CONCRETE PIPE

- A. Prior to the installation of any pipe, a meeting shall be called by the Contractor, to include the Contractor, the pipe manufacturer, and the City DWM to review recommended procedures, to include pipe joining techniques and quality control.
- B. Excavation for the pipe and preparation of the trench bottom, including bedding to receive the pipe, shall be done in accordance with the requirements of Section 02225. In the preparation of the pipe bedding, the Contractor shall take into consideration any variation in thickness of the pipe wall, and the bed must be prepared to suit the particular piece of pipe to be lowered into place. Preparation of the compacted bed shall be such that when the pipe is lowered in place and pulled to secure full compressive pack of the rubber joint ring, a smooth and uniform flow line on the specified grades will be secured. An interior inspection of the sewer will be made after sufficient time has elapsed for the backfill to attain its settlement in the trench.

- C. The pipe interior and joints shall be clean when lowered in the trench and shall be kept clean thereafter. The exposed ends of pipe in the trench shall be closed by suitable bulkheads at all times when pipe laying is not actually in progress. Each section of pipe shall be securely anchored in place before the next adjoining pipe is laid and the joint between the sections is made.
- D. No tools or equipment shall be used in the laying of the pipe that will damage the pipe. The trenching equipment shall not be used to force a joint of pipe into its proper position on grade by application of pressure on top of the pipe along its partial or full length. All pipe joints shall be brought home by use of properly designed equipment for the specific purpose as approved by the Engineer. Pipe lengths that have received damage to wall, spigot or socket shall be replaced or repaired in accordance with industry standards. Such replacement or repair shall be at the Contractor's expense.
- E. At times when the work of installing pipe in the trench is not in progress, all openings into the pipe in the trench shall be closed to prevent the entrance of foreign materials into the pipe.
- F. The Contractor shall secure the following results with the pipe and joint used:
 - 1. A tight joint with gasket fully compressed and joint openings completely filled.
 - 2. Water tightness after the trench has been backfilled and the water table has reached its normal level. The allowable infiltration shall not exceed limits as specified in ASTM C969 and ASTM C1103.
 - 3. Pipeline shall have a smooth and uniform interior section free from cracks, pits, voids, or crazing as defined in Sections 13 and 15 of ASTM C76. Longitudinal and transverse cracks with a width less than 0.01-inch shall be considered hairline and minor. Seal longitudinal and transverse cracks having a width equal to or greater than 0.01-inch and less than 0.10-inch if there is displacement across the crack and the soil pH is less than 5.5. Replace pipes having longitudinal and transverse cracks greater than 0.10-inch.
- F. Backfilling shall be in accordance with the requirements of Section 02225.

3.02 CLEANING

After completion of pipe installation, the Contractor shall clean all pipe by flushing with water or other means to remove all dirt, stone wood or other materials which may have entered the pipe during construction.

3.03 TESTING

- A. After pipe installation, backfilling and cleaning, the Contractor shall test all pipe and joints in accordance with the requirements of ASTM C969 and ASTM C1103. Pipe and joints failing the tests shall be subject to rejection or replacement at the Contractor's expense.
- B. Infiltration Tests for Reinforced Concrete Pipe:
 - 1. Infiltration tests shall be conducted when the groundwater level is at least two feet above the pipe crown in accordance with ASTM C969. The Contractor shall install suitable weirs in manholes to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be in accordance with ASTM C969. The Contractor shall install weirs for a minimum of four hours before measuring flow. If leakage in any section of the sewer line exceeds the requirements of ASTM C969, the Contractor shall locate and repair leaks. Repair methods shall be in accordance with industry standards. After repairs are completed, the Contractor shall re-test for leakage. Infiltration testing shall be performed before sanitary sewer lateral connections are made.
 - 2. The Contractor shall furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests.
 - 3. Weirs shall be V-notch type equal to Pollard or approved equal.
- C. Exfiltration Test for Reinforced Concrete Pipe: For pipes up to and including twenty-seven (27) inches in diameter, exfiltration testing shall be conducted, if the groundwater table is less than two (2) feet above the pipe crown, in accordance with ASTM C969.
- D. Pipe Joint Tests: Pipe joints for sewers thirty (30) inches in diameter and larger shall be air tested individually. Individual testing will be done in accordance with ASTM C1103. The joint tester assembly shall be Cherne Industries, Inc. or approved equal.
- E. Additional testing and inspection required for the acceptability of installed sanitary sewers is specified in Section 02650.

3.04 CLEANUP

After completing each section of sewer line, the Contractor shall remove all debris and construction materials and equipment from the site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean and neat condition. The Contractor shall restore the site of the Work to its original or better condition.

+++ END OF SECTION 02536 +++

**SECTION 02537
DUCTILE IRON SANITARY SEWER PIPE**

PART 1 GENERAL

1.01 SCOPE

The Contractor shall provide all labor, materials, equipment and incidentals required to install and test ductile iron sanitary sewer pipe and fittings.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be submitted to the City DWM as part of the Project record:
1. Proposed methods, equipment, materials, and sequence of operations for sewer construction. The Contractor shall plan operations to minimize disruption of utilities and to occupied facilities on adjacent property.
 2. Manufacturers' instructions indicating special procedures required to install products specified.
 3. Product manufacturers shall provide the City DWM with written certification that all products furnished comply with all applicable provisions of these Specifications.
- B. Submit drawings to the City DWM showing a complete laying plan of all pipe, including all fittings adapters, valves and specials along with the manufacturer's drawings and specifications indicating complete details of all items.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards:
1. ANSI/AWWA C104/A21.4 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 2. ANSI /AWWA C110/A21.10 – Ductile-Iron and Gray-Iron Fittings.
 3. ANSI /AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

4. ANSI /AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
5. ANSI /AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe.
6. ANSI /AWWA C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast.
7. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings for Water Service
8. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
9. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
10. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
11. ASTM C969 – Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
12. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.
13. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings.
14. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning.

1.04 TRANSPORTATION AND HANDLING

- A. Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.
- B. Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.
- C. Lined pipe shall be handled and transported to prevent damage to lining.

1.05 STORAGE AND PROTECTION

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.

- C. Pipe shall be stored per the manufacturer’s recommendations.
- D. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

1.06 ACCEPTANCE

Acceptance will be on the basis of the Contractor’s inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet for the sizes required to complete the Work. All pipe shall have a minimum pressure rating, as indicated in the following table, and corresponding minimum wall thickness, unless otherwise required. Pipe wall thickness shall also be determined based upon depth of cover and anticipated live load assuming a minimum H2O live load.

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 20	250
24	200
30 - 64	150

- B. Fittings and Accessories:
 - 1. Fittings shall be ductile iron and shall conform to AWWA C110/ANSI A21.10 or AWWA C153/ANSI A21.53, with a minimum rated working pressure of 250 psi.
 - 2. Flanged elbow fittings shall be ANSI pattern using short radius elbows. Special fittings, ductile iron wall pipes and sleeves shall conform to the dimensions and details as required by the installation conditions.
- C. Joints:
 - 1. General:
 - a. Joints for ductile iron pipe and fittings shall be mechanical joints, flanged or push-on joint.

- b. Unless otherwise required based on installation conditions or as directed by the manufacturer, all buried ductile iron pipe shall be joined using push-on type joints.
- c. Gaskets shall be made of material that will not be damaged by the fluid being transported or by the environment in which the pipe is installed.
- d. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit.

2 Push on Joints:

- a. Push-on joints and gaskets shall conform to ANSI/AWWA C111/A21.11.
- b. Details of joint design shall be in accordance with the manufacturer's standard practice such as ACIPCO "Fastite", McWane (CLOW) "Bell-Tite" or U.S. Pipe "Tyton".

3 Flanged Joints:

- a. Flanged joints and gaskets shall conform to ANSI/AWWA C115/A21.15.
- b. Nuts and bolts for flanged connections shall be square or hex carbon steel bolts conforming to ASME B18.2.1 Nuts shall conform to ASME B18.2.2.

4 Mechanical Joints:

- a. Joints shall conform to ANSI/AWWA C111/ A21.11.
- b. Tee head bolts and nuts shall be of high strength low-alloy steel in accordance with ASTM A242 to the dimensions shown in ANSI/ AWWA C111/ A21.11.
- c. Gaskets shall be in accordance with ANSIAWWA C111/ A21.11 and shall be constructed of plain rubber.
- d. Mechanical joint glands shall be ductile iron.

D. Polyethylene Encasement:

- 1. Ductile pipe and fittings shall be encased in polyethylene.
- 2. Polyethylene encasement shall be as specified in Section 02616.

E. Wall Pipes

1. Where piping passes through concrete structures, furnish and install wall pipes or other provisions as required. Wall sleeves shall be accurately located and securely fastened into position before concrete is poured.
2. Wall pipes shall be either statically cast iron with integral waterstop collar or centrifugally cast ductile iron with a continuously welded waterstop collar. The waterstop collar shall be capable of withstanding a thrust force caused by a 250 psi dead end load from either direction on that size pipe.
3. Wall pipes shall be furnished uncoated on the outside and cement lined on the inside.
4. Wall pipes shall be cast and/or fabricated and lined in one manufacturer's facilities and delivered to the job site ready for use.

2.02 LINING

A. All ductile iron pipe and fittings shall have a double thickness cement mortar lining conforming to the requirements of ANSI/ AWWA C104/A21.4.

B. Cement Lining

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

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

2.03 COATING

All ductile iron pipe and fittings shall have a standard bituminous outer coating.

PART 3 EXECUTION

3.01 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. Lay all pipe and fittings to accurately conform to the lines and grades shown on the Drawings.
- B. Pipe Installation
 - 1. Proper equipment, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings and valves shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances shall sewer materials be dropped or dumped into the trench.
 - 2. All pipe, fittings, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Contractor, who may prescribe corrective repairs or reject the materials.
 - 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe which contains dirt shall be laid.
 - 4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
 - 5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
 - 6. Lay pipe with the bells up grade.
 - 7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted.
- C. Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug.

D. Joint Assembly

1. Push-on joints shall be assembled in accordance with the manufacturer's recommendations.
2. The Contractor shall internally inspect each pipe joint to insure proper joint assembly after the pipe has been brought to final alignment.

E. Cutting Pipe

1. Cut the pipe per the manufacturer's written recommendations.
2. Remove all burrs and smooth the end before jointing.
3. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, accessories and closure pieces in the correct location. Only push-on and mechanical joint pipe shall be cut.

F. Pipe Coupling Installation

1. Pipe couplings shall be installed where required or recommended by the pipe manufacturer. Couplings shall be installed in strict conformance with the manufacturer's instructions.
2. Pipe ends shall be cleaned, brushed or filed to produce a mating surface that is free of dirt, rust, chuck marks, mill scores, dents, burrs or other foreign substances that would impede proper gasket seating.
3. A lubricant recommended by the coupling manufacturer shall be used in seating all gaskets.

G. Wyes and tees shall be installed where required based on actual field conditions.

H. Chimneys will be required at locations required based on field conditions. The chimneys shall be constructed of ductile iron pipe and fittings and shall be encased in 4-inches (minimum) of crushed stone.

J. Manhole drops shall be constructed of ductile iron pipe and fittings where required and encased in concrete as specified in Section 03300.

K. Stubs for future pipe connections shall be installed in outlets where directed by the City DWM. Stubs shall be ductile iron pipe with a plug.

3.02 CLEANING

At the completion of pipe installation, the Contractor shall clean all pipe by flushing with water or other means to remove all dirt, stone wood or other materials which may have entered the pipe during construction.

3.03 TESTING

- A. After pipe installation, backfilling and cleaning, the Contractor shall test all sewer pipe and joints by low pressure air testing. Pipe and joints failing the tests are subject to rejection, repair, or replacement at the Contractor's expense.
- B. Additional testing and inspection required for acceptability of installed sanitary sewers is specified in Section 02650.

3.04 CLEANUP

After completing each section of the sewer line, the Contractor shall remove all debris and construction materials and equipment from the site of the Work, grade and smooth over the surface on both sides of the line and leave the entire construction area in a clean and neat condition. The Contractor shall restore the site of the Work to its original or better condition.

+++ END OF SECTION 02537 +++

SECTION 02538
SEWER SERVICE CONNECTIONS

PART 1 GENERAL

1.01 SCOPE

- A. The work covered by this section includes furnishing and installing new sewer service connections to new main line sewers of the size and type required.
- B. The work covered under this section also includes disconnecting and removing existing sewer service connections from existing main line sewers and reconnecting the existing sewer service connections to new main line sewers.
- C. Sewer service connections shall be terminated at the edge of the existing right-of-way or easement or connected to existing sewer service connections.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to City DWM as part of the Project record:
 - 1. Product data for pipe, fittings, couplings and adapters.
 - 2. A complete list of sewer service connections including length and diameter of each sewer service connection along with stations of new main line sewer service connection points shall be submitted prior to removal of sewer service connections from the existing main line sewer.
 - 3. Work plans detailing sewer service connection removal, replacement and repair methods.
 - 4. Record drawings showing location of replaced sewer service connections.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions to the following standards.
 - 1. ANSI/AWWA C111/ A21.11 - Rubber Gaskets Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
 - 2. ASTM A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications

3. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe
4. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
5. ASTM C425 – Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
6. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
7. ASTM C1173 – Standard Specification for Flexible Transition Couplings for Underground Piping Systems
8. ASTM D1784 - Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
9. ASTM D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedule 40, 80, and 120
10. ASTM D3034 - Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
11. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe and fittings for sewer service connections shall be as specified in Section 02537.
- B. Flexible Couplings
 1. Sleeve type flexible couplings shall be designed to connect and repair pipelines of different materials and diameters.
 2. Couplings shall consist of:
 - a. SBR synthetic rubber collar
 - b. Stainless steel shear ring
 - c. Stainless steel sealing clamps with worm gear or take-up nuts and bolts
 3. Couplings shall conform to ASTM C1173 and shall be manufactured by Fernco Inc., Mission Rubber Company or equal.

- C. Grout: Grout for filling abandoned sewers shall conform to the requirements of Section 03600.

PART 3 EXECUTION

3.01 GENERAL

- A. The Contractor shall identify underground sewer service connections on the Demolition and Utility and Services Abandonment Plan.
- B. The Contractor shall not allow sand, debris, or runoff to enter the sewer system.
- C. The Contractor shall ensure that wastewater does not backup onto private property. The Contractor shall establish a plan to prevent sewer backups when sewer service connections are not replaced in a timely manner.
- D. The Contractor shall be responsible for all damage to property due to his work. Any damage caused to private property shall be corrected or repaired to the satisfaction of the property owner at the Contractor's expense.
- E. The Contractor shall remove and replace service connections, including those that go to unoccupied or abandoned buildings, unless directed otherwise by the City DWM.

3.02 PREPARATION

- A. The Contractor shall control traffic in accordance with the requirements of **Section 01550**.
- B. The Contractor shall coordinate with property owners whose sanitary sewer service will be interrupted in accordance with the requirements of **Section 01351**.
- C. The Contractor shall provide for diversion of wastewater if necessary, in accordance with the requirements of Section 02600.
- D. All existing, new and proposed sewer service connections shall be identified prior to pipe removal. Existing sanitary sewer service connections shall be located by CCTV as specified in Section 02655.

3.03 CONNECTIONS TO NEW SEWER

- A. The Contractor shall install wyes or tees in the main line sewer for future service connections or connections to existing sewer services. Connection of sewer service lines or risers to new main lines sewers less than or equal to 18-inches in diameter shall be by means of tees or wyes.

- B. The Contractor's attention is directed to the City DWM's standard details that show alternate methods of making service connections to main line sewers larger than 18-inches in diameter.
- C. The Contractor shall plug the branch of the wye or tee until the service connection pipe is installed.
- D. The Contractor shall make up the connection between the new main line sewer and the existing service line using sewer pipe, and fittings conforming to the requirements of paragraph 2.01 of this Section.
- E. The Contractor shall record the location of fittings installed on the Record Drawings.

3.04 REMOVAL OF EXISTING SEWER SERVICE CONNECTIONS

- A. Existing sewer service connection pipe shall be removed or abandoned as necessary to allow for installation of the new sewer service connection.
- B. The vertical alignment of the new main line sewer may either be above, below or at the same elevation as the existing main line sewer. After exposing the existing sewer service connection, the Contractor shall remove the existing sewer service connection and furnish and install a new service connection to the new main line sewer.
- C. Pipe removed shall be immediately removed from the work site by the Contractor. Pipe shall not be removed until sufficient replacement pipe is on site and available for installation.
- D. The Contractor shall plug the open ends of all abandoned sewer service pipe using concrete conforming to the requirements of Section 03300.

3.05 CONNECTIONS TO EXISTING SEWER

- A. The Contractor shall remove a portion of the main line sewer and install a wye or tee for connecting the sewer service line to the main line sewer.
- B. The wye or tee shall be connected to the existing main line sewer with couplings as specified in paragraph 2.01 of this section.
- C. The Contractor shall make up the connection between the new main line sewer and the existing service connection using the same diameter pipe as currently connected to the sewer. Minimum pipe diameter shall be 6-inches.
- D. The Contractor's attention is directed to the City DWM's standard details which show alternate methods of making service connections to main line sewers larger than 18-inches in diameter.

- E. Service connections shall be made at the top or from the side at forty-five (45) degrees of the sewer line.
- F. In the event a lined pipe is encountered, the host pipe (outer) pipe material shall be used to determine the service line pipe material.

3.06 INSTALLATION OF SERVICE CONNECTIONS

- A. The minimum slope for a service connection shall be two percent (2%), unless the existing service connection is at a lower slope, in which case the Contractor shall lay the service connection at the existing slope. The installation of service lines shall comply with the requirements of Section 02225.
- B. Sewer service connections from main line sewers will be extended on a straight uniform grade from the main point to the terminus. Sewer service connections shall not exceed a depth of twelve (12) feet below finished grade at the end of the connection at the right-of-way or easement line.
- C. Sewer service connections to be extended from main line sewers where the property being served does not require the full depth, may be brought up to grade with a riser pipe. Riser pipe shall be installed in accordance with the City DWM's standard details.
- D. Sewer Service Connections Crossing Pavement
 - 1. Service connections may be installed by open trench if permitted by the City, Fulton County or the Georgia Department of Transportation. Installation of service connections by the open trench method shall meet the requirements of Section 02225.
 - 2. If an open trench is not permitted, the service connections shall be installed by jack and bore in accordance with industry and City DWM standards. .
- E. If the service connection ends in rock, the Contractor shall excavate the rock an additional three (3) feet beyond the plugged end.
- F. All sewer service connections shall be provided with a cleanout at the easement or right-of-way line.
- G. The Contractor shall test new service lines before backfilling.

3.07 UTILITY SERVICE REPAIRS

Where utility service connections to the user's premises are disconnected, broken, damaged, or otherwise rendered inoperable by the Contractor for any reason, the Contractor shall, at its own expense, arrange with the respective utility company for any repairs of lines under their jurisdiction, or for any lines not within their jurisdiction or the Contractor shall repair or replace same and restore service to the premises.

3.08 TESTING

- A. Following completion of sanitary sewer installation and replacement of service connections, the Contractor shall perform CCTV, smoke testing or other industry standard testing method to confirm that all service connections are reconnected.
- B. Before backfilling, couplings shall be pressure tested in accordance with the manufacturer's instructions.
- C. If any joint shows leakage, the jointing material shall be removed and the joint remade. If any pipe is defective, it shall be removed and replaced.

3.09 CLEANUP

- A. The Contractor shall replace pavements, curbs and gutters, driveways and sidewalks removed or damaged by excavation in accordance with the requirements of the applicable sections of these specifications and the City DWM's standard details.
- B. In unpaved areas, the Contractor shall bring the surface to grade and slope surrounding the excavation. The Contractor shall replace a minimum of four (4) inches of topsoil and seed according to the requirements of Section 02920.

+++ END OF SECTION 02538 +++

**SECTION 02539
ABANDONMENT OF EXISTING SEWERS**

PART 1 – GENERAL

1.01 SCOPE

The work covered under this section includes furnishing all labor, materials, and equipment required for abandonment of existing sewers and appurtenances as required.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract. Prior to beginning work, a schedule of demolition and detailed methods to be used on each pipeline or structure to be abandoned or demolished shall be submitted to the City DWM for informational purposes.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or specified in these Specifications.
1. ASTM C150 - Standard Specification for Portland cement.
 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 3. ASTM C1107 – Standard Specification for Packaged, Dry, Hydraulic Cement Grout (Nonshrink)
 4. CRD C621 - Corps of Engineers Specification for Non-shrink Grout.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Crushed stone aggregate backfill, as specified in Section 02225, shall be used where applicable for work described in this Section.
- B. Concrete shall be 3000 psi as specified in Section 03300.
- C. Grout for filling abandoned sewers, shall conform to the requirements of Section 03600.

PART 3 – EXECUTION

3.01 ABANDONING EXISTING SEWER LINES

A. General

1. Abandon in place all existing sewer lines and manholes required to be abandoned in accordance with the Contractor's Demolition and Utility and Services Abandonment Plan. Abandon existing sewer lines and manholes after the new sewer line has been placed in service and all sewer services have been transferred over to the new line.
2. The Contractor shall be responsible for uncovering and verifying the size and material of the existing sewer lines to be abandoned.

- B. Abandoned sewer lines shall be inspected prior to grout filling. The Contractor shall strongly consider television inspection, smoke testing, and/or dye testing to determine whether there are active service connections. The Contractor shall not grout fill sewer lines with active connections.

3.02 GROUT FILL OF ABANDONED SEWER LINES

- A. Grout shall be pumped into the sewer line from the upstream end with sufficient pressure to insure that the line is completely filled.
- B. Where manholes and structures are to remain in service, the Contractor shall ensure that no grout enters sewer lines, manholes and structures that are to remain in service. If required, the interior manhole or surface shall be repaired to achieve a smooth surface using an industry-accepted method.

3.03 ABANDONING SEWER MANHOLES

- A. The Contractor shall remove from manholes to be abandoned the existing manhole frame and cover and deliver them to the City DWM's pipe yard. The Contractor shall remove riser section(s) to a minimum depth of 3-feet below existing or finished grade, whichever is lower.
- B. The Contractor shall backfill the manhole with earth backfill compacted to a minimum of 95% of the maximum dry density, unless shown or specified otherwise by Contractor.

3.04 REMOVAL AND BACKFILL OF EXISTING SEWERS

- A. The Contractor shall completely remove existing sewer pipe to the limits shown on the Contractor's Demolition and Utility and Services Abandonment Plan. Pipe removed shall be immediately removed from the Work site by the Contractor.

- B. The Contractor shall backfill the trench with earth backfill compacted to a minimum of 95% of the maximum dry density, unless otherwise required based on the location of backfill.
- C. Where new pipe is to be installed in the same trench from which existing pipe was removed, the Contractor shall backfill the trench with crushed stone aggregate up to 1-foot above the top of the new pipe if existing pipe invert is below new pipe invert.

3.05 REMOVAL AND BACKFILL OF EXISTING MANHOLES AND STRUCTURES

- A. The Contractor shall completely remove manholes and structures where indicated on the Contractor's Demolition and Utility and Services Abandonment Plan.
- B. The Contractor shall backfill the excavation with earth backfill compacted to a minimum of 95% of the maximum dry density, unless otherwise required based on the location of backfill.

3.06 CLEANUP

- A. After the abandonment or removal work has been completed, the Contractor shall restore the project area to a condition equal to or better than existed prior to construction Site restoration shall be performed in accordance with the requirements of Section 02920.
- B. Disturbed grassed areas shall be restored as specified in Section 02933.

+++ END OF SECTION 02539 +++

**SECTION 02545
POLYVINYL CHLORIDE GRAVITY SEWER PIPE**

PART 1 GENERAL

1.01 SCOPE

The Contractor shall furnish all labor, materials, and equipment required and install and test polyvinyl chloride gravity sewer pipe for sanitary sewer installations.

1.02 SUBMITTALS

- A. Submittals shall be in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM as part of the Project record:
1. Product Data: Descriptive details and shop drawings covering full details of pipe, fittings, specials, joints and assembly thereof, joint materials and details thereof, and full details and cuts of all castings to be incorporated into the Work.
 2. Manufacturer's Installation Instructions: Special procedures required to install products specified.
 3. Manufacturer's Certificate: A manufacturer's certificate certifying that products meet or exceed the requirements of ASTM D3034, ASTM F679, ASTM F1336 and the requirements of these Specifications.
- B. Submit shop drawings to the City DWM as part of the Project record showing a complete laying plan of all pipe, including all fittings adapters, valves and specials along with the manufacturer's drawings and specifications indicating complete details of all items. The pipe details shall include stationing, pipe class or design and supporting computations; and laying schedule which specifies pipe class, class coding, pipe stationing for all changes in grade, and transition stations for various pipe classes and limits of each.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
1. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications

2. ASTM D 2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
3. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
4. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
5. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
6. ASTM F679 – Standard Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
7. ASTM F1336 - Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings
8. ASTM F1417 - Standard Practice for Installation Acceptance of Plastic non-pressure Sewer Lines Using Low-Pressure Air

1.04 TRANSPORTATION AND HANDLING

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.
- B. Handling: Handle pipe, fittings and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.

1.05 STORAGE AND PROTECTION

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.
- C. Pipe shall be stored in accordance with the manufacturer's recommendations.
- D. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

E. PVC pipe and fittings shall not be stored in direct sunlight.

1.06 ACCEPTANCE

- A. Acceptance shall be on the basis of in-plant testing and inspection of manufactured pipe for visual defects and imperfections in accordance with the requirements of ASTM D3034 and ASTM F1336.
- B. The Contractor shall provide to the City DWM for informational purposes manufacturer's results of testing on pipe, joint materials and assembled joints. These tests shall include material and hydrostatic leakage tests on pipe of each size in accordance with the requirements of ASTM D3034 and ASTM F1417.
- C. The Contractor shall inspect the pipe after delivery for shape, cracks, uniformity, blisters and imperfect surfaces, damaged ends, and gasket grooves. The Contractor shall not use repaired or patched pipe or pipe with repaired or patched gasket grooves or shoulders. Pipe and fittings with imperfections in the barrel or socket will be rejected.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE

Polyvinyl chloride gravity sewer pipe shall be SDR 35 and shall conform to all requirements of ASTM D3034 and ASTM F1336.

2.02 FITTINGS AND SPECIALS

- A. All fittings and specials shall be manufactured and furnished by the pipe supplier and shall have bell and spigot configurations compatible with the pipe. Fittings and specials shall be in conformance with the requirements of ASTM F1336.
- B. The Contractor shall provide service connections and associated fittings as required to reconnect existing service connections to PVC pipe. Connections shall be made by using factory made wyes or tees.

2.03 JOINTS

Joints for PVC pipe and fittings shall be gasketed bell and spigot, push on type conforming to the requirements of ASTM D3212. Elastomeric gaskets shall conform to ASTM F477 and shall be factory installed or field installed in accordance with the manufacturer's instructions. Lubricant shall be as recommended by the pipe manufacturer.

2.04 COUPLINGS

Couplings for connecting new service lines to existing polyvinyl chloride pipe shall be as specified in Section 02538.

2.05 PIPE MARKINGS

- A. All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer, the plant where the pipe was made, and the strength designation.
- B. Pipe shall be colored green for in-ground designation as sewer pipe.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The Contractor shall install PVC pipe in accordance with the requirements of ASTM D2321.
- B. Excavation for the pipe and preparation of the trench bottom, including bedding to receive the pipe shall be done in accordance with the requirements of this section and Section 02225.
- C. Pipe bedding material shall be a gravel-sand mixture conforming to ASTM D2487 and shall be placed on a flat undisturbed trench bottom with a minimum thickness as shown on the Drawings. Pipe haunching materials shall be shovel-sliced in the haunch area of the pipe
- D. The pipe shall be placed true to line and grade. Bell holes shall be dug and the barrel of the pipe provided with uniform and continuous support.
- E. Pipe shall be joined together in accordance with the manufacturer's recommendations using lubricant supplied by the manufacturer.
- F. Field cutting of pipe shall be perpendicular to the pipe axis. All field cuts shall be beveled to match the factory bevel.
- G. Trench backfilling shall be performed in accordance with the requirements of Section 02225 and the manufacturer's recommendations.
- H. At times when the work of installing pipe is not in progress, all openings into the pipe in the trench shall be closed to prevent the entrance of foreign materials into the pipe.

3.02 CLEANING

At the completion of pipe installation, the Contractor shall clean all pipe by flushing with water or other means to remove all dirt, stone wood or other materials which may have entered the pipe during construction.

3.03 TESTING

- A. After pipe installation, backfilling and cleaning, testing shall be performed by low pressure air testing and deflection testing as specified hereinafter.
- B. All wyes, tees and stubs shall be plugged with flexible caps or plugs, or approved alternate, and securely fastened to withstand the internal test pressure. Caps and plugs shall be removable.
- C. Air Testing
 - 1. Testing shall be performed by the low pressure air test method conforming to the requirements of ASTM F1417.
 - 2. Each section between manholes or structures shall be plugged. Air shall be introduced into the plugged system. The system shall pass the test if the air loss, as measured by the pressure drop from 3.5 psi to 2.5 psi, does not occur within the time interval found in ASTM F1417.
 - 3. Lines which fail any acceptance testing shall be evaluated and the source of leakage corrected. The line shall then be retested for compliance with the requirements of these specifications.
- D. Joint Testing: Joints shall be tested in accordance with the requirements of ASTM D3212.
- E. Additional testing and inspection required for acceptability of installed sanitary sewers is specified in Section 02650.

3.04 CLEANUP

After completing each section of sewer line, the Contractor shall remove all debris and construction materials and equipment from the site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean and neat condition. The Contractor shall restore the site of the Work to its original or better condition.

+++ END OF SECTION 02545 +++

**SECTION 02600
WASTEWATER FLOW CONTROL**

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall furnish and install all labor, materials, equipment and incidentals required to bypass all existing wastewater flow as necessary in conjunction with the removal and abandonment of existing sewers and the construction of new sewers as required and shown on the Contractor's Demolition and Utility and Services Abandonment Plan.
- B. The Contractor shall include the installation of an auto dialer in the bypass pumping system and a lock box for the pump controls and float levels. Auto dialers shall have the ability to connect to a minimum of two of the Contractor's staff and the City DWM when a failure/power outage occurs.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM as part of the Project record:
 - 1. The design, installation, and operation of the wastewater flow control system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor that specializes in the design and operation of wastewater flow control systems. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
 - 2. The Contractor shall prepare a wastewater flow control plan and submit it to the City DWM prior to diverting any flow. The wastewater flow control plan shall include the make and model of temporary bypass pumps, the certified noise levels of the pumps and generator, the means used to maintain and operate the bypass pumps, and a written statement that all bypass pumping shall comply with the requirements of these Specifications and any local codes and ordinances.
 - 3. The wastewater flow control plan shall be submitted to the City DWM at least ten (10) days before any planned diversion. The plan shall outline all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows. The plan shall be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary and/or required to insure adequate wastewater control. The plan shall also include details of protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the

requirements and permit conditions specified in these Specifications. No construction shall begin until all provisions and requirements have been reviewed and accepted by the City DWM.

4. The Contractor shall submit the wastewater flow control plan for each sewer bypass set-up with detail including the following:
 - a. Staging areas for pumps.
 - b. Sewer plugging method and types of plugs. Double plugs are recommended.
 - c. Number, size, material, location, and method of installation of suction piping.
 - d. Bypass pump sizes, capacity, number of each size to be on the Work site and power requirements.
 - e. Calculations of static lift, friction losses, and flow velocity (pump curves) showing pump operating range.
 - f. Standby power generator size and location.
 - g. Downstream piping and discharge plan.
 - h. Method of protecting discharge manholes or structures from erosion and damage.
 - i. Thrust and restraint block sizes and locations.
 - j. Sections showing suction and discharge pipe depth, embedment, select fill, and special backfill where required.
 - k. Certified decibel levels of individual pumps, the combined decibel level if multiple pumps will be operated simultaneously and the method of noise control for each pump and/or generator.
 - l. Any temporary pipe supports, including rollers and elevated rollers, as well as anchoring required.
 - m. Design plans and computations for access to bypass pumping locations.
 - n. Calculations for selection of bypass pumping pipe size.
 - o. Schedule for installation and maintenance of bypass pumping lines.
 - p. Plan indicating location of bypass pumping line.
 - q. The Plan shall indicate the means by which flows from laterals are provided for either by plugging, containing, or subsidiary pumping. Building laterals shall not be disconnected or plugged overnight. Plugging of laterals is only allowed from 9 a.m. until 5 p.m. of the same day.
 - r. Pump security including lockable cover over switches so pumps cannot be disabled by others.
5. Any proposal to implement wastewater flow control arrangements on sewers, including plugging and/or blocking, high-velocity nozzles, and/or bypass and/or diversion pumping as well as any sewer repair replacement construction, shall be outlined in writing and submitted to the City DWM at least ten (10) days prior to the implementation of the wastewater flow control system, sewer repair or replacement.
6. All proposed wastewater flow control arrangements, including flow bypass and/or diversion plans, shall indicate or show the location and position, as necessary, of any special features where pipes or hoses cross roadways, including intersections, such as temporary trenches, support bridges, ramp-overs, etc.

7. All proposed wastewater flow control arrangements, including wastewater flow bypass and/or diversion pumping plans for sewers, shall also include an emergency response plan to be followed in the event of a failure of the wastewater flow control system. The Contractor shall provide names and phone numbers for twenty-four (24) hour emergency contact. Provide cell phone type auto-dialers for unattended operations.
8. The Contractor shall notify the City DWM twenty-four (24) hours prior to commencing actual wastewater flow control operations. The Contractor's Wastewater Flow Control Plan shall be approved by the City DWM before the Contractor shall be allowed to commence wastewater flow control work.

1.03 GENERAL

The objective of wastewater flow control is to:

1. Maintain an uninterrupted level of service to wastewater collection system users while maintenance or construction operations are occurring on the segment or segments being bypassed and/or from which flow is being diverted, within the wastewater collection system.
2. Ensure that wastewater flow is continuously handled around the segment or segments of sewer being bypassed and/or from which flow is being diverted by:
 - a. Ensuring that bypass and diversion pumps are adequately fueled, lubricated and maintained.
 - b. Ensuring backup spare parts are readily available for the flow bypass and/or diversion pumping system in the event of component breakdown.
 - c. Ensuring that an emergency backup plan is implemented in the event of system failure.
 - d. Preventing backup, spillage, flooding or overflow onto streets, yards and unpaved areas or into buildings, adjacent ditches, storm sewers, and waterways, while flow bypass or diversion pumping takes place and ensuring that installation, startup and subsequent disassembly of the flow bypass and diversion pumping system is transitioned.

1.04 REGULATORY REQUIREMENTS

- A. The work of this section shall comply with the current versions, with revisions, of OSHA 29 CFR 1910.146 (permit-required confined-space regulations).
- B. All Work and testing shall comply with the applicable Federal codes, including Federal Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, as amended, and applicable state and local codes and standards; and to the extent applicable with the requirements of the Underwriter's Laboratories, Inc. and the

PART 2 PRODUCTS

2.01 PIPE FOR FLOW DIVERSION

- A. Ductile Iron Pipe: Ductile iron pipe as specified in Section 02537 is acceptable for use for flow diversion during construction.
- B. Polyethylene Pipe: Polyethylene material shall comply with the requirements for Type III polyethylene, C-5 and P-34 as tabulated in ASTM D1248 and have the Plastic Pipe Institute recommended designation PE3406. The material shall also have an average specific base resin density of between 0.94 g/cc and 0.955 g/cc (ASTM D1505). Pipe made from these resins must have a long term strength (50 years) rating of 1,250 psi or more per hydrostatic design basis categories of ASTM D2837. The polyethylene resin shall contain antioxidants and be stabilized against ultraviolet degradation to provide protection during processing and subsequent weather exposure. The polyethylene resin shall have an environmental stress crack resistance, condition C as shown in ASTM D1693, to be greater than five-hundred (500) hours, twenty (20) percent failure. All pipe shall be made from virgin quality material. No rework compound, except that obtained from the manufacturer's own production of the same formulation shall be used. The polyethylene resin shall have an average melt flow index, condition E as shown in ASTM D1238, not in excess of 0.25 g/10 min. Pipe shall be homogeneous throughout, and free of visible cracks, holes, foreign material, blisters, or other deleterious faults. Diameters and wall thickness shall be measured in accordance with the requirements of ASTM D2122. Pipe joining will be done by thermal butt fusion method in accordance with the requirements of ASTM D657.
- C. Pipes do not have to be new but must be free of defects.
- D. Piping shall be hydrostatic tested in excess of operating pressure prior to pumping any wastewater.

2.02 PUMPING EQUIPMENT

- A. All pumps used shall be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.
- B. All pumps (and generators if used) shall be fully sound attenuated and shall not produce a noise level in excess of the applicable local codes/ordinances.
- C. The Contractor shall provide the necessary stop/start controls for each pump.
- D. The Contractor shall include one stand-by pump of each size to be maintained on site of

the Work. Back-up pumps shall be on-line, isolated from the primary system by a valve.

- E. The Contractor shall design all piping, joints, and accessories to withstand twice the maximum system pressure or fifty (50) psi, whichever is greater. The back-up pump, appropriate piping, fuel, lubrication, and spare parts shall be incorporated into the bypass arrangement at the site of the Work, ready for use in case of breakdown. A bypass “drill” shall be carried out by the City DWM before the bypass arrangement is accepted on all sewers greater than twelve (12) inches in diameter, at no cost to the City DWM. The drill shall demonstrate the incorporation of all standby equipment to handle flows when the main pump set is switched off. The City DWM’s instructions following the drill shall be adhered to in full at no cost to the City DWM.
- F. No more than two (2) pump discharge hoses shall be used for wastewater flow control over a length of the line segment(s). If the flow exceeds the capacity of two (2) hoses then rigid piping shall be used. The rigid piping shall consist of ductile iron pipe, HDPE, or steel pipes with suitable pressure rated couplings to withstand twice the maximum system pressure or fifty (50) psi, whichever is greater.
- G. Under no circumstances will aluminum “irrigation” type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the Engineer.

2.03 SYSTEM DESCRIPTION

A. Design Requirements:

The estimated flows to be bypassed are included in the Technical Requirements, Basis of Design Report.

- 2. The Contractor shall provide all pipeline plugs, pumps, and temporary discharge piping to ensure that the total mainline flow is diverted around the section on which work is being done.
- 3. Wastewater flow control system will be required to be operated twenty-four (24) hours per day.
- 4. The Contractor shall have adequate standby equipment available and ready for operation and use in the event of an emergency or breakdown. One (1) standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.
- 5. The wastewater flow control system shall be capable of bypassing the flow around the work area and of releasing any amount of flow, up to full available flow, into the work area as necessary for satisfactory performance of the Work.

B. Performance Requirements:

1. The Contractor shall provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the wastewater flow before it reaches the point where it would interfere with the Work, carry it past the Work, and return it to the existing sewer downstream of the work.
2. The Contractor shall provide all necessary means to safely convey the wastewater past the work area. The contractor will not be permitted to stop or impede the mainline flows under any circumstances.
3. The Contractor shall maintain wastewater flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers, and that will protect public and private property from damage and flooding.
4. The Contractor shall protect water resources, wetlands, and other natural resources.

PART 3 EXECUTION

3.01 PLANNING

The Contractor shall be solely responsible for planning and executing all wastewater flow control operations. The Contractor shall be entirely liable for damages to private or public property that may result from his operations and for all cleanup, disinfection, damages, and resultant fines in the event of a spillage, flooding, or overflow.

3.02 GENERAL

- A. All materials used for wastewater flow control shall be industry standard and as specified herein.
- B. The Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbances to existing utilities. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.
- C. During all wastewater flow control operations, the Contractor shall protect mainlines, manholes, and all local sewer lines from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to mainlines, manholes, and all local sewer lines caused by human or mechanical failure.
- D. When existing storm or sanitary sewers are required to be abandoned or relocated, the Contractor, at his own expense, shall provide and maintain temporary outlets and connections for all private or public drains, sewers, and sewer outlets connected to or served by the sewers to be abandoned or relocated and where necessary, shall provide

adequate pumping facilities and shall maintain these services until such time as the permanent sewers and connections are constructed and in service at no cost to the City DWM.

- E. The Contractor shall use the provided construction easement or existing right-of-way for the flow diversion unless Contractor is able to make other arrangements..
- F. Wastewater flow diversion controls must keep the wastewater flowing without discharge or spills.
- G. The Contractor shall seek and obtain inspection of each section of newly laid sewer before taking the diversion out of service and placing the newly laid section in service.
- H. When pumps are operating, a maintenance operator, mechanic and/or assistant shall continuously be on site to monitor the operation of the entire bypass/diversion system. The operator, mechanic and/or assistant shall:
 - 1. Adjust pump speed as appropriate so as not to adversely impact upstream or downstream flow condition levels.
 - 2. Check that the bulkheads, dams, diaphragms, plugs, valves, weirs, and all other flow control devices are working effectively.
 - 3. Check the integrity of hoses and couplings along the entire bypass/diversion system.
 - 4. Monitor fuel tanks and top off as appropriate.
 - 5. Monitor lubrication levels and top off as necessary.
 - 6. Facilitate minor repairs as required.
 - 7. Report on potential problems arising.
 - 8. Inspect bypass-pumping system at least hourly to ensure that the system is working correctly.
 - 9. Maintain adequate supply of spare parts on site as required.

3.03 PUMPING AND BYPASSING

- A. When bypass pumping is required, a pump size shall be selected by the Contractor. The Contractor shall supply the necessary pumps, conduits, and other equipment to divert the flow of wastewater around the manhole section in which the Work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rainstorms. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits, and other

equipment required to divert the flow of wastewater around a manhole to manhole section, from the start to finish of work performed in the manhole to manhole section.

- B. Wastewater shall be pumped directly into the nearest available downstream manhole. The Contractor shall be responsible for keeping the pumps running continuously twenty four (24) hours a day if required, until the bypass operation is no longer required. The Contractor shall have standby pumps at all times.
- C. Contractor shall secure discharge hose/piping into downstream manhole to prevent spills.

3.04 FLOW CONTROL PRECAUTIONS

- A. Where the wastewater flow is blocked or plugged, the Contractor shall be responsible for taking sufficient precautions to protect public health. The sewer lines shall also be protected from damage. The following shall apply:
 - 1. No wastewater shall be allowed to back up into any homes or buildings.
 - 2. No wastewater shall overflow any manholes, cleanouts, or any other access to the sewers.
 - 3. No interruption of water and sewer utilities users upstream of the inspection/repair area shall be allowed to occur.
 - 4. If any of the above occur or are expected to occur, the Contractor shall provide bypass pumping to alleviate all of the conditions. Additionally, the Contractor shall observe the conditions upstream of the plug and be prepared to immediately start bypass pumping, if needed.
- B. Any sump pumps, bypass pumps, trash pumps, or any other type of pump which pulls wastewater or any type of material out of the manhole or sewer shall discharge the material into another manhole, or appropriate vehicle or container approved by the Engineer. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, road, or open environment.
- C. The Contractor shall take appropriate steps to ensure that all pumps, piping, and hoses that carry raw wastewater are protected from traffic. Traffic control shall be performed in accordance with the requirements of **Section 01550**.
- D. In the event that raw wastewater is spilled, discharged, leaked, or otherwise deposited in the open environment due to the Contractor's work, the Contractor shall be responsible for any cleanup of solids and stabilization of the area affected. This work shall be performed at the Contractor's expense with no additional cost to the City DWM. The Contractor shall also be responsible for notifying the sewer system maintenance personnel and complying with any and all regulatory requirements for cleaning up the spill at no additional cost to the City DWM.

- E. During wastewater flow control operations, the Contractor shall take proper precautions to prevent damage to existing sanitary sewer facilities, flooding or damage to public or private property.
- F. The Contractor shall make repairs or replacements or rebuild such damaged section or sections of existing sewers. All such repairs, replacements, and rebuilding shall be paid for by the Contractor.
- G. The Contractor shall make such provisions as are necessary for handling all flows in existing sewers, connections, and manholes by pipes, flumes or by other approved methods at all times, when his operations would, in any way, interfere with normal functioning of those facilities.
- H. The Contractor shall be responsible for the removal of any debris and sedimentation in the existing sewers, laterals and manholes, etc., which is attributable to the Work.
- I. All operations shall be performed by the Contractor in strict accordance with OSHA and any applicable local safety requirements. Particular attention is directed to safety regulations for excavations and entering confined spaces.
- J. It is the Contractor's responsibility to notify any property owner having a sewer service connection being reconnected to the new sanitary sewer that such work is being performed. The Contractor shall notify property owners in accordance with requirements of **Section 01351**. The Contractor shall be solely responsible for any damage caused by property service connection backups caused by his Work.
- K. Piping used for temporary flow diversion of storm water and wastewater shall not be used for temporary flow diversion of potable water.

+++ END OF SECTION 02600 +++

SECTION 02607
MANHOLES, JUNCTION STRUCTURES, CATCH BASINS AND INLETS

PART 1 GENERAL

1.01 SCOPE

Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required to install cast-in-place manholes, junction structures, catch basins and inlets. All work shall be installed, adjusted, tested and placed in operation in accordance with these Specifications and the manufacturer's recommendations.

1.02 SUBMITTALS

Submittals shall be in accordance with the requirements of the Contract.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
1. ASTM C32 – Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
 2. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections
- B. Prior to delivery, all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory or certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable.
- C. After delivery to the site, any materials, which have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the site.

1.04 WARRANTY

Provide a warranty against defective materials and workmanship in accordance with the requirements of the Contract.

PART 2 PRODUCTS

2.01 GENERAL

Cast-in-place manholes, junction structures, catch basins and inlets shall be constructed of specified materials to the sizes, shapes and dimensions required in accordance with City DWM standards.

2.02 MATERIALS AND CONSTRUCTION

A. Concrete and Reinforcement:

1. Concrete used for construction of manholes, junction structures, catch basins and inlets shall be 3000 psi concrete conforming to the requirements of Section 03300.
2. Steel reinforcement shall conform to the requirements of Section 03200.

B. The following sulfide resistant options shall be incorporated in the concrete mix design.

1. Sulfide Resistant Additive

- a. Where specified, a sulfide resistant additive shall be added to the concrete mix. The sulfite resistant additive shall permeate the concrete during the mixing phase and molecularly bond to the cement particles to become an integral component of the hardened concrete product and create an environment incompatible to thiobacillus bacteria growth and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid.
- b. When the additive is used, it shall be introduced into the concrete mix at the pipe manufacturing facility, with one gallon of the additive replacing one gallon of water in each cubic yard of concrete produced.
- c. The Contractor shall include provisions in his Quality Control Plan to coordinate with the pipe manufacturer to verify that the additive is placed in the concrete mix in the proper amount on a uniform and consistent basis for all reinforced concrete sanitary sewer pipe produced for this Project requiring the additive.
- d. When the additive is used, the pipe manufacturer shall be required to provide special markings on each pipe section designating it a "special design for the City of Atlanta, containing Sulfide Resistant Additive". The manufacturer may also use a dye in the concrete mix to give the finished pipe section a unique color.
- e. The sulfide resistant additive shall be Con^{MIC}Shield[®], supplied by Vermillion and Associates, Chattanooga, Tennessee, or equal.

2. Sulfide Resistant Limestone Aggregate

- a. When used, the limestone aggregate shall permeate the concrete during the mixing phase and molecularly bond to the concrete particles to become an integrand component of the hardened concrete product and create an environment incompatible to thiobacillus bacteria growth and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria interacting with the hydrogen sulfide gas and producing sulfuric acid.
- b. All precast concrete manholes shall be made with concrete with a minimum compressive strength per ASTM C478 and the absorption shall not exceed nine (9) percent. All cement and aggregate shall conform to the requirements of ASTM C478. Coarse aggregate shall be well graded limestone of a size that provides a homogenous concrete mixture, considering the pipe wall thickness. Fine aggregate shall consist of graded limestone sand, limestone screenings or natural sand that provides a homogenous concrete mixture, considering the pipe wall thickness.
- c. The minimum alkalinity of the hardened concrete, as determined by ASTM C497, shall not be less than 50% expressed as calcium carbonate (CaCO₃). Cement for pipe shall be Type I, Type II or Type I/II Portland cement.
- d. All admixtures shall be approved by the Contractor prior to use. Prior to manufacturing any pipe, the manufacturer shall submit the proposed concrete design mix with the estimated finished concrete alkalinity to the City DWM as part of the Project record. The requirements of this article shall apply to all reinforced concrete pipe manufactured under the requirements of ASTM C478.

3. Sulfide Resistant Coatings

- a. When used, all sulfide resistant coatings shall provide an impenetrable bond to the hardened surface of the concrete pipe. The coating shall prevent the bacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid on the surface of the concrete wall of the pipe.
- b. When a coating is used, it shall be applied at the concrete manufacturing facility, tested and inspected in accordance with the coating manufacturer's specifications. Specifications shall be submitted to the Contractor prior to use.
- c. The sulfide resistant coating shall be a polyurea elastomer coating or approved equal.

4. Sulfide Resistant Liners

- a. When used, all sulfide resistant liners shall be concrete poured against the lining and vibrated and compacted in a manner to protect the lining and to produce a dense homogenous concrete, securely anchoring the lining locking extensions into the concrete in accordance with the liner manufacturer's specifications and create an environment incompatible to thiobacillus growth, to inhibit microbial induced corrosion by preventing the thiobacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid.
 - b. When a liner is used, it shall be installed at the concrete manufacturing facility, inspected and tested in accordance with the lining manufacturer's specifications. Liner joints shall be field welded in accordance with the liner manufacturer's recommendations.
 - c. The sulfide resistant liner shall be Agru America HDPE Sure Grip Liner, GSE StudLiner, Ameron T-Lock Liner or equal.
- B. Brick: Brick shall conform to the requirements of ASTM C32.
1. Brick used for construction of sewer inverts shall be Grade SS or SM.
 2. Brick used for construction of manholes, junction structures, catch basins and inlets shall be Grade MS or MM.
- C. Mortar: Mortar for brick masonry and similar work shall be composed of 1 part of Portland cement and 2 parts of mortar sand, by volume. Portland cement shall conform to the requirements of ASTM C150. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15 percent of the weight of cement used. Hydrated lime shall meet the requirements of ASTM C207, Type S.
- D. Water: Water shall be clean and free of deleterious amounts of acids, alkalies, or organic material.
- E. Precast Concrete Manholes are specified in Section 02641.
- F. Manhole frames, covers and steps are specified in Section 05500.
- G. Frames and grates are specified in Section 05500.

PART 3 EXECUTION

3.01 CONSTRUCTION OF BRICK STRUCTURES

- A. Foundations: A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of 3000 psi reinforced concrete mixed, prepared, and placed in accordance

with the requirements of Section 03300. The foundation shall be built to the correct elevation and shall be finished to cause the least possible resistance to flowing water.

B. Laying Brick:

1. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it, which can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set shall be removed, cleaned, and relaid with fresh mortar.
2. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

C. Joints:

1. All joints shall be slushed with mortar at every course, but slushing alone will not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or pargeted with a coat of mortar not less than 1/2-inch thick before the backing is laid up. Prior to pargeting, all joints on the back of face courses shall be cut flush.
2. Unless otherwise noted, joints shall be not less than 1/4-inch or more than 1/2-inch wide and whatever width is adopted shall be maintained uniform throughout the work.

D. Pointing: Face joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

E. Cleaning: Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing down with water and, if necessary to produce satisfactory results, cleaning shall be done with a 5 percent solution of muriatic acid which shall then be rinsed off with liberal quantities of clean fresh water.

- F. Curing and cold weather protection: In hot or dry weather the brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost in the brick or when the air temperature is below 50 degrees F unless the Contractor has on the project, ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60 degrees F for the duration of the curing period.

3.02 CONSTRUCTION OF CAST-IN-PLACE CONCRETE MANHOLES

- A. Cast-in-place manholes, excluding curved manhole bases, shall be constructed in place with the base, barrel, and conical section all monolithically cast using removable forms of material and design using industry-standard practice.
- B. The vertical forms, vertical and horizontal wall spacers, steps and placing cone shall be carefully positioned and firmly clamped in place before any placement is made. The wall spacers shall be located 90 degrees from each other. The forms shall be firmly supported with bottom of forms at the proper elevation to permit the base to be deposited through the vertical forms.
- C. No pipe penetration shall be formed within 12-inches of a corner, on a square bases, or within 12-inches of another penetration, in any direction, for circular bases.
- D. Concrete for manhole bases shall be deposited down through the wall forms onto undisturbed earth or shall be rock bearing. The concrete shall be evenly distributed around the walls and vibrated both inside and outside the forms until there is a minimum slope of 60 degrees from the bottom of the forms to the bearing surface both inside and outside of the manhole. When this is complete and before additional concrete is added, the concrete shall be carefully vibrated on each side of each sewer pipe.
- E. The base shall be concentric with the manhole, except where eccentric alignment with ladder is required, and have a minimum diameter of 4-feet or 16-inches greater than the outside diameter of the manhole whichever is greater, and 10-inches minimum thickness under the lowest pipe. Minimum wall thickness shall be 6-inches.
- F. Additional concrete shall be deposited in evenly distributed layers of approximately 18-inches with each layer vibrated to bond it to the preceding layer. The wall spacers shall be raised as the placements are made. The concrete in the area from which the spacer is withdrawn shall be vibrated. Excessive vibration shall be avoided.
- G. Grade adjustment rings shall be used to adjust manhole frame to grade and shall be precast reinforced concrete conforming to ASTM C478. Rings shall be free of cracks, voids and other defects. Adjustment rings shall be tested to assure compliance with impact and loading requirements in accordance with AASHTO's Standard Specifications.

- H. All manhole bases, including curved manhole bases and inverts shall be constructed of 3000 psi concrete in accordance with City DWM standards. Inverts shall be smooth and accurately shaped and have the same cross section as the invert of the sewers to which they connect. The manhole base and invert shall be carefully formed to the required size and grade by gradual and even changes in sections, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations. Changing directions of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. The invert and flow channel shall be formed during or immediately after the placing of the concrete and brush-finished as soon as the concrete has sufficiently set.
- I. Form marks and offsets shall not exceed 1-inch on the outside surface of the manhole. Form marks and offsets shall not exceed 1/2-inch inside of the manhole. All offsets on the inside surface of the manhole shall be smoothed and rubbed so there is no projection or irregularity capable of scratching a worker or catching and holding water or other materials. Honeycombed areas shall be completely removed immediately upon removal of the forms and replaced with a 3000 psi concrete or patched with epoxy grout.
- J. Should circumstances make a joint necessary, a formed groove or reinforcing dowels shall be required in the top of the first placement for shear protection. Immediately before the second placement is made, the surface of the cold joint shall be thoroughly cleaned and wetted with a layer of mortar being deposited on the surface.
- K. Concrete setting time and backfilling shall be in accordance with the applicable requirements of Section 03300. Masonry work shall be allowed to set for a period of not less than 24 hours. Outside forms, if any, then shall be removed and the manhole backfilled and compacted. All loose or waste material shall be removed from the interior of the manhole. The manhole cover then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

3.03 PIPE CONNECTIONS AT STRUCTURES

Pipes shall extend through the walls of the structure as required. The pipes shall be cut off flush with the structure wall on the inside surface. For cast-in-place concrete or brick structures, mortar shall be placed around the pipes so as to form a neat, watertight connection.

3.04 MANHOLES AND JUNCTION STRUCTURES OVER EXISTING SEWERS

- A. Construct manholes and/or junction structures over existing operating sewer lines at required locations. Perform necessary excavation, break into existing sewer and construct manhole.
- B. Maintain flow through existing sewer lines at all times, and protect new concrete and mortar work for a period of 7 days after the concrete has been placed. Advise the City DWM of plans for diverting wastewater flow and obtain approval before starting in

accordance with Section 02600. City DWM's approval will not relieve the Contractor of responsibility for maintaining adequate capacity for flow at all times and adequately protecting new and existing work.

- C. Construct the new base under the existing sewer and install precast sections or cast-in-place walls as specified above.
- D. Break out the existing sewer within the new manhole, cover the edge of the sewer with mortar, and trowel smooth.

3.05 INSPECTION AND TESTING

After completion, all manholes will be inspected. The Contractor is required to provide access and equipment to the inspector for the safe review of the system. The Contractor shall make, at Contractor's expense, all necessary changes, modifications and/or adjustments required to assure satisfactory operation.

+++ END OF SECTION 02607 +++

SECTION 02616
POLYETHYLENE ENCASUREMENT OF DUCTILE IRON PIPE

PART 1 GENERAL

1.01 SCOPE

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

1.02 SUBMITTALS

Submittals shall be in accordance with the requirements of the Contract. In addition the following specific information shall be provided to the City DWM as part of the Project record:

Certificate of compliance with ANSI/AWWA C105/A21.5

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Drawings or specified herein.

- 1. ANSI/AWWA C105/A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems
- 2. ANSI/AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.
- 3. ASTM D149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
- 4. ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- 5. ASTM D1709 – Standard Test Methods for Impact Resistance of Thin Plastic Film by the Free-Falling Dart Method.
- 6. ASTM D1992 – Standard Test Method for Propagation Tear Resistance of Plastic

Film and Thin Sheeting by Pendulum Method.

7. ASTM D4976 – Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

PART 2 PRODUCTS

2.01 POLYETHYLENE FILM

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

- B. Linear low-density polyethylene film.

1. Linear low-density polyethylene film shall be manufactured of virgin polyethylene material in accordance with ASTM D4976.

2. Physical properties of finished film:

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

* Minimum in machine and transverse direction

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

- C. High-density cross laminated polyethylene film.

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

2. Physical properties of finished film:

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

* Minimum in machine and transverse direction

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

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

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

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

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

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

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

PART 3 EXECUTION

3.01 INSTALLATION

- A. The Contractor shall remove all lumps of clay, mud, cinders, etc. on the pipe surface before installation of the polyethylene encasement. During installation, soil or embedment material shall not be trapped between the pipe and the polyethylene.
- B. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings and to prevent damage to the polyethylene by backfilling operations. Overlaps shall be secured with adhesive tape.
- C. For installation below the water table tube form polyethylene shall be used with both ends sealed with tape or plastic tie straps at the joint overlap. Circumferential wraps of tape shall be placed at 2-foot intervals along the barrel of the pipe to minimize the space between the polyethylene and the pipe.
- D. Installation on ductile iron pipes shall be in accordance with methods A, B or C as outlined in ANSI/AWWA C105/A21.5 and as specified below. Methods A and B are for use with polyethylene tubes and Method C is for use with polyethylene sheets.
 1. Method A:
 - a. Cut polyethylene tube to a length approximately 2-feet longer than the pipe section. Slip the tube around the pipe, centering it to provide 1-foot overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears the pipe ends.
 - b. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at the joints to facilitate installation of the polyethylene tube.
 - c. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack along the barrel of the pipe, securing the fold at quarter points. Proceed to the next section of pipe in the same manner.
 2. Method B:
 - a. Cut polyethylene tube to a length approximately 1-foot shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide 6-inch of bare pipe at each end. Take up the slack width at the top to the pipe for a snug but not tight fit along the barrel of the pipe securing the fold at quarter points. Secure the ends with polyethylene tape.

- b. Before making up a joint, slip a 3-foot length of polyethylene tube over the end of the preceding pipe section, bunching it accordion-fashion lengthwise. Alternatively, place a 3-foot length of polyethylene sheet in the trench under the joint to be made. After completing the joint, pull the 3-foot length of polyethylene over or around the joint. Overlapping the polyethylene previously installed on each end snug and secure with polyethylene tape. A shallow bell hole is necessary and shall be made at joints to facilitate the installation of the polyethylene tube or sheet.

3. Method C:

- a. Cut polyethylene sheet to a length approximately 2-feet longer than that of the pipe section. Center the cut length to provide a 12-inch overlap on each adjacent pipe section, bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe so that it circumferentially overlaps the top quadrant of the pipe. Secure the cut edge of the polyethylene sheet at intervals of approximately 3-feet.
- b. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at the joints to facilitate installation of the polyethylene. After completing the joint, make the overlap and secure the ends as specified in Para. 3.01B of this Section.

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

3.02 REPAIRS

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

3.03 OPENINGS IN ENCASEMENT

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

3.04 JUNCTIONS BETWEEN WRAPPED AND UNWRAPPED PIPE

- A. Where polyethylene wrapped pipe joins an adjacent pipe that is not wrapped, extend the polyethylene wrap to cover the adjacent pipe for a distance of at least 3-feet. Secure the end with circumferential turns of adhesive tape.

- B. Service lines of dissimilar metals shall be wrapped with polyethylene or a suitable dielectric tape for a clear minimum distance of 3-feet away from the ductile iron pipe.

3.05 BACKFILL FOR POLYETHYLENE-WRAPPED PIPE

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

+++ END OF SECTION 02616 +++

SECTION 02641
PRECAST CONCRETE MANHOLES

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall provide all labor, materials, equipment and incidentals required to furnish and install precast concrete manholes complete.
- B. This section also includes pipe connections at manholes, manhole testing, backfill, cleanup and all other incidentals necessary to complete the Work specified under this Section.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements Contract. In addition, the following specific information shall be provided to the City DWM as part of the Project record:
 - 1. Shop drawings of manhole sections and base units and construction details, including reinforcement, jointing methods, and materials.
 - 2. Summary of criteria used in the manhole design including, as a minimum, material properties, loadings, load combinations, and dimensions assumed.
 - 3. Materials to be used in fabricating drop connections.
 - 4. Materials to be used for pipe connections at manhole walls.
 - 5. Materials to be used for stubs and stub plugs, if required.
 - 6. Materials and procedures for corrosion resistant liner and coatings, if required.
 - 7. Plugs to be used for vacuum testing.
 - 8. Manufacturer's data for pre-mix (bag) concrete, if used for channel inverts and benches.
 - 9. Description of the proposed method of concrete curing.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
1. ASTM C270 - Standard Specification for Mortar for Unit Masonry
 2. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gaskets
 3. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
 4. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes
 5. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink)
 6. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
- B. Prior to delivery, all basic materials specified in this section shall be tested and inspected by an approved independent testing laboratory. Certified copies of test reports prepared by the manufacturer’s testing laboratory will also be acceptable.
- C. After delivery to the site of the Work, any materials which have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the site of the Work.
- D. The precast concrete producer shall demonstrate adherence to the standards set forth in the National Precast Concrete Association Quality Control Manual. Precast concrete producer shall meet requirements written below.
1. The precast concrete producer shall have been in the business of producing precast concrete products similar to those specified for a minimum of 5 years. The precast concrete producer shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the precast concrete producer to produce quality products consistent with industry standards.
 2. The precast concrete producer shall show that the following tests are performed in accordance with the ASTM standards indicated below. Tests shall be performed for each 150 cu. yd. of concrete placed, but not less frequently than once per week.

- a. Slump: C143
 - b. Compressive Strength: C31, C192 and C39
 - c. Air Content (when air-entrained concrete is being used): C231 or C173
 - d. Unit Weight: C138
3. The precast concrete producer shall provide documentation demonstrating compliance with this subparagraph.
 4. The plant shall notify the City DWM when the pre-cast products are being produced for the project. The City DWM may place an inspector in the plant when the products covered by this specification are being manufactured.

1.04 DESIGN CRITERIA

Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions required and in accordance with City DWM standards.

1. The height or depth of the manhole will vary with the locations, but shall be such that the top of the manhole frame will be at the finished grade of the pavement or higher than the ground surface.
2. The invert will be at the required elevation.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE MANHOLES

- A. Precast concrete manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming to the City DWM's standard manhole details.
- B. Precast manhole section shall be manufactured, tested and marked in accordance with the latest provisions of ASTM C478.
- C. The minimum compressive strength of the concrete for all sections shall be 4,000 psi.
- D. The maximum allowable absorption of the concrete shall not exceed 8 percent of the dry weight.
- E. The circumferential reinforcement in the riser sections, conical top sections and base wall sections shall consists of one (1) line of steel and shall be not less than required by ASTM C478.

- F. The ends of each reinforced concrete manhole riser section and the bottom of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous and uniform manhole.
- G. Precast manhole section joints shall be offset tongue and groove type, supplied with Tylox Super Seal pre-lubricated gasket as manufactured by Hamilton Kent, RPS lubricated gasket as manufactured by Press-Seal Gasket Corporation or Conseal CS-202 butyl rubber sealant as manufactured by Concrete Sealants, Inc.
- H. Each section of the precast manhole shall have not more than two (2) slots for the purpose of handling and laying. These slots shall be tapered and shall be plugged with rubber stoppers or mortar after installation.
- I. The interior and exterior surfaces of the manhole shall have a smooth hard finish, and shall be free from cracks, chips, and spalls.
- J. All components of a manhole for a particular location shall be clearly marked in order that the manhole may be correctly assembled to suit construction conditions existing at that particular location.
- K. The following sulfide resistant options shall be incorporated in the concrete mix design.

1. Sulfide Resistant Additive

- a. Where specified, a sulfide resistant additive shall be added to the concrete mix. The sulfite resistant additive shall permeate the concrete during the mixing phase and molecularly bond to the cement particles to become an integral component of the hardened concrete product and create an environment incompatible to thiobacillus bacteria growth and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid.
- b. When the additive is used, it shall be introduced into the concrete mix at the pipe manufacturing facility, with one gallon of the additive replacing one gallon of water in each cubic yard of concrete produced.
- c. The Contractor shall include provisions in his Quality Control Plan to coordinate with the pipe manufacturer to verify that the additive is placed in the concrete mix in the proper amount on a uniform and consistent basis for all reinforced concrete sanitary sewer pipe produced for this Project requiring the additive.
- d. When the additive is used, the pipe manufacturer shall be required to provide special markings on each pipe section designating it a "special design for the City of Atlanta, containing Sulfide Resistant

Additive". The manufacturer may also use a dye in the concrete mix to give the finished pipe section a unique color.

- e. The sulfide resistant additive shall be Con^{MIC}Shield[®], supplied by Vermillion and Associates, Chattanooga, Tennessee, or equal.

2. Sulfide Resistant Limestone Aggregate

- a. When used, the limestone aggregate shall permeate the concrete during the mixing phase and molecularly bond to the concrete particles to become an integrand component of the hardened concrete product and create an environment incompatible to thiobacillus bacteria growth and to inhibit microbial induced corrosion by preventing the thiobacillus bacteria interacting with the hydrogen sulfide gas and producing sulfuric acid.
- b. All precast concrete manholes shall be made with concrete with a minimum compressive strength per ASTM C478 and the absorption shall not exceed nine (9) percent. All cement and aggregate shall conform to the requirements of ASTM C478. Coarse aggregate shall be well graded limestone of a size that provides a homogenous concrete mixture, considering the pipe wall thickness. Fine aggregate shall consist of graded limestone sand, limestone screenings or natural sand that provides a homogenous concrete mixture, considering the pipe wall thickness.
- c. The minimum alkalinity of the hardened concrete, as determined by ASTM C497, shall not be less than 50% expressed as calcium carbonate (CaCO₃). Cement for pipe shall be Type I, Type II or Type I/II Portland cement.
- d. All admixtures shall be submitted to the City DWM prior to use. Prior to manufacturing any pipe, the manufacturer shall submit the proposed concrete design mix with the estimated finished concrete alkalinity to the Contractor for approval. The requirements of this article shall apply to all reinforced concrete pipe manufactured under the requirements of ASTM C478.

3. Sulfide Resistant Coatings

- a. When used, all sulfide resistant coatings shall provide an impenetrable bond to the hardened surface of the concrete pipe. The coating shall prevent the bacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid on the surface of the concrete wall of the pipe.
- b. When a coating is used, it shall be applied at the concrete manufacturing facility, tested and inspected in accordance with the coating manufacturer's specifications.
- c. The sulfide resistant coating shall be a polyurea elastomer coating or equal.

4. Sulfide Resistant Liners

- a. When used, all sulfide resistant liners shall be concrete poured against the lining and vibrated and compacted in a manner to protect the lining and to produce a dense homogenous concrete, securely anchoring the lining locking extensions into the concrete in accordance with the liner manufacturer's specifications and create an environment incompatible to thiobacillus growth, to inhibit microbial induced corrosion by preventing the thiobacillus bacteria from interacting with hydrogen sulfide gas and producing sulfuric acid.
- b. When a liner is used, it shall be installed at the concrete manufacturing facility, inspected and tested in accordance with the lining manufacturer's specifications. Liner joints shall be field welded in accordance with the liner manufacturer's recommendations.
- c. The sulfide resistant liner shall be Agru America HDPE Sure Grip Liner, GSE StudLiner, Ameron T-Lock Liner or equal.

2.02 MANHOLE FRAMES, COVERS AND STEPS

Manhole frames and covers and steps are specified in Section 05500.

2.03 SPECIALTY ITEMS

- A. One piece manholes shall be manufactured in accordance with the requirements of ASTM C478 and the City DWM's standards. They shall be cast utilizing 4000 psi concrete containing type II cement. They shall be manufactured with a minimum eight (8) inches thick base with dowel steel reinforcement and waterstop. They shall be used only in situations which will not accommodate a twenty-four (24) inch base section and twenty-four (24) inch conical section.
- B. Manhole tees shall be manufactured in accordance with the requirements of ASTM C478 and the City DWM's standards. They shall be cast utilizing 4000 psi concrete.
- C. Saddle manholes shall be manufactured in accordance with the requirements of ASTM C478 and the City DWM's standards. Saddles shall be cast utilizing 4000 psi concrete.

2.04 BRICK

- A. Bricks used to adjust manhole frame to grade shall conform to the requirements of ASTM C32, Grade MS.

- B. All brick shall be new and whole, of uniform standard size, and straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, free from injurious cracks and flaws, and shall have a clear ring when struck together. No soft or salmon brick shall be used in any part of the Work. Brick shall be culled after delivery, if required, and no culls shall be used except at such places, to such extent, and under such conditions as may be approved by the Contractor.

2.05 MORTAR

- A. Mortar shall be made of one part Portland cement and two parts clean sand. Cement shall be type 1 and shall conform to ASTM C150. Sand shall meet requirements of ASTM C144.
- B. Mortar shall be prepared only in the quantities needed for immediate use. Mortar which has been mixed for more than thirty (30) minutes or which has set or has been retempered shall not be used in the Work.

2.06 GRADE ADJUSTMENT RINGS

- A. Grade adjustment rings shall be used to adjust manhole frame to grade and shall be precast reinforced concrete conforming to ASTM C478. Rings shall be free of cracks, voids and other defects.
- B. Adjustment rings shall be tested to assure compliance with impact and loading requirements in accordance with AASHTO's Standard Specifications.

2.07 BITUMINOUS WATERPROOFING

- A. H. B. Tnemecol 46-465 by Tnemec Company
- B. Amercoat 78 Hb by American International
- C. Bitumastic Super Service Black by Carboline
- D. Or equal.

PART 3 EXECUTION

3.01 GENERAL

- A. All activities shall be performed in accordance with the manufacturer's recommendations and regulations established by OSHA. Attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.

- B. The Contractor shall verify lines and grades prior to installation.

3.02 INSTALLATION OF PRECAST CONCRETE MANHOLES

- A. All precast concrete manhole base sections and drop manhole bases shall be set on a foundation of #57 compacted stone aggregate, twelve (12) inches minimum thickness, and covering the entire bottom of the excavation for the manhole.
- B. Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as shown on the Drawings. Manhole inverts shall be constructed of 3000 psi concrete and shall have the same cross-section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- C. After the base section has been set, and inverts formed, the precast manhole sections shall be placed thereon, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations.
- D. Where the difference in the invert elevation of two (2) or more sewers, eighteen (18) inches in diameter or smaller, intersecting in one (1) manhole is two (2) feet or more, a drop manhole shall be constructed in the manner shown on the Drawings. Drop manholes shall be similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed outside the manhole and encased in 1500 psi (minimum) concrete.
- E. The top elevation of manhole frames shall be adjusted to grade unless shown otherwise required by City DWM standards. A maximum adjustment of twelve (12) inches will be allowed using brick and mortar or grade adjustment rings. Adjustments greater than twelve (12) inches must be made by changing precast riser sections. Brick used will be in accordance with the requirements of this section.
- F. The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the riser section. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement.
- G. Shallow manholes shall be constructed to the sizes, shapes, and dimensions as required in accordance with City DWM standards. Shallow manholes shall be constructed of precast concrete sections.

3.03 PIPE CONNECTIONS AT MANHOLES

- A. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored and after pipe installation sealed with an approved non-shrink grout. In addition to the non-shrink grout, the opening shall be additionally sealed as follows:
1. A rubber boot connector shall be utilized as an additional method of sealing the space between the manhole wall and the pipe. Rubber boot connectors shall be required for all pipes forty two (42) inches in diameter and smaller. The rubber boot connector shall be Kor-N-Seal as manufactured by Trelleborg Pipe Seals or equal as manufactured by Press-Seal Gasket Corporation or Hamilton Kent.
 2. Connector shall conform to the requirements of ASTM C923 and shall be made from ethylene propylene diene monomer (EPDM) rubber.
 3. All stainless steel elements of the rubber boot connector shall be totally non-magnetic series 304 stainless, excluding the worm screw for tightening the steel band around the pipe which shall be series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break-away torque wrench. The rubber boot connector shall seal the manhole wall opening by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer. The connector shall be of a size specifically designed for the pipe material and size being utilized on the Project.
 4. Openings for pipes larger than forty two (42) inches in diameter shall be sealed by pouring a concrete collar around the pipe.
- B. Both methods of sealing manhole openings shall be in accordance with City DWM standards.

3.04 WATERPROOFING

Apply two heavy coats of bitumastic waterproofing material to exterior surfaces of sanitary sewer manholes or structures by brush or spray in accordance with the manufacturer's instructions.

3.05 MANHOLES OVER EXISTING SEWERS

Construction of manholes over existing sewers is specified in Section 02607.

3.06 MANHOLE TESTING

- A. All manholes shall be tested by the Contractor using the vacuum test method, following the manufacturer's recommendations.
- B. Testing:
 - 1. Manholes shall be tested for water tightness in accordance with ASTM C1244. Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced.
 - 2. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc. or approved equal.
 - 3. All repairs shall be made in accordance with the requirements of ASTM C478.
- C. The City DWM reserves the right to have third party consultants perform construction materials testing and assessments on any new manhole.
- D. Additional testing and inspection required for the acceptability of installed of sanitary and storm sewers is specified in Section 02650.

3.07 BACKFILL

The Contractor shall place and compact backfill materials, in the area of excavation surrounding manholes in accordance with the requirements of Section 02225.

3.08 CLEANUP

After the manhole installation work has been completed and all testing accepted by the Engineer, the Contractor shall cleanup the area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. Disturbed grassed areas shall be seeded or sodded. Site restoration shall be performed in accordance with the requirements of Section 02920.

+++ END OF SECTION 02641 +++

SECTION 02650
TESTING FOR ACCEPTANCE OF SANITARY AND STORM SEWERS

PART 1 GENERAL

1.01 SCOPE

- A. This section includes sanitary and storm sewer inspection and testing methods; joint testing procedures; manhole testing methods; allowable testing limits for sanitary sewers; and any other incidental or appurtenant operations which may be necessary to properly complete the Work.
- B. The Contractor shall provide all labor, materials, and equipment required for all sanitary and storm sewers testing and related operations necessary or convenient for completing the Work.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ASTM C828 – Test Method for Low-pressure Air Test of Vitrified Clay Pipe Lines
 - 2. ASTM C969 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
 - 3. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
 - 4. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
 - 5. ASTM F1417 – Standard Practice for Installation Acceptance of Plastic non-pressure Sewer Lines Using Low Pressure Air

1.04 ACCEPTANCE TESTS

- A. Upon completion of all or a part of a sanitary sewer installation, the Contractor shall test and/or inspect the sewer for acceptability. The method(s) of testing and/or inspection shall be as specified by the Contractor and industry standards. Testing and inspection shall be performed in accordance with the requirements of this Section.

- B. One or more of the following tests and/or inspections may be required:
1. Infiltration of Water
 2. Exfiltration of Water
 3. Exfiltration of Air under Pressure
 4. Smoke Testing
 5. Joint Testing
 6. Direct Visual Inspection
 7. Deflection Testing
 8. Dye Testing
 9. Closed Circuit Television Inspection (CCTV).
- C. The Contractor shall notify the City DWM 48 hours in advance prior to the Contractor performing any testing.
- D. Prior to any testing, all lines shall be cleaned of debris and flushed clean. Debris shall be caught and removed from the line and shall not be flushed into existing live sanitary sewers.

1.05 TEST SECTIONS

The Contractor may at his option divide the installed sewer into subsections of more convenient length for testing. If the section or subsection tested does not pass the tests, it shall be repaired and the test repeated until a satisfactory test is obtained.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 SANITARY AND STORM SEWER INSPECTION AND TESTING METHODS

- A. All Testing Methods: All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, and securely fastened to withstand the internal test pressure. Plugs or caps shall be readily removable.

- B. The Contractor shall clean and test lines before requesting final acceptance. Where any obstruction is met, the Contractor shall clean the sewers by means of rods, swabs, or other instruments. Contractor shall flush out lines and manholes before final inspection.
- C. Pipelines shall be straight and show a uniform grade between manholes, except for curves specifically shown. The Contractor shall correct any discrepancies discovered during inspection at no cost to the City DWM.
- D. Watertightness
 - 1. All sewers constructed shall be tested for watertightness. Infiltration and exfiltration tests shall be performed on all new sewers constructed as specified in this section, except for those new sewers constructed which have active services tied into them as the pipe is being installed. In such cases the watertightness of the sewers less than or equal to thirty-six (36) inches in diameter shall be based on a visual inspection, and for sewers forty-two (42) inches in diameter and larger based on the individual joint test as specified in this section.
 - 2. All visible leaks, regardless of the amount of leakage, shall be repaired at the Contractor's expense.
- E. Infiltration Tests
 - 1. The Contractor shall install weirs in manholes to determine the leakage of ground water into the sewer. The Contractor shall install weirs for a minimum of four hours before measuring flow. If leakage in any section of the sewer line exceeds one hundred (100) gallons per inch of diameter per day per mile, the Contractor shall locate and repair leaks. Repair methods shall be in accordance with industry standards. After repairs are completed, the Contractor shall re-test for leakage.
 - 2. Infiltration testing shall be performed before sanitary sewer lateral connections or reconnections are made.
 - 3. The Contractor shall furnish, install and remove the weirs, plugs, and bulkheads required to perform the leakage tests.
 - 4. Weirs shall be V-notch type equal to Pollard.
- F. Exfiltration Tests
 - 1. Low-Pressure Air Test:
 - a. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections

using inflatable balls pulled through the line from manhole to manhole.

- b. Air shall be slowly supplied to the plugged sewer section until the internal air pressure reaches approximately four (4) psi. After this pressure is reached and the pressure allowed to stabilize (approximately two (2) to five (5) minutes), the pressure shall be reduced to three and one-half (3.5) psi before starting the test.
- c. Record the drop in pressure for the test period. If the pressure drop is equal to or less than one (1) psi during the test time, then the line will pass the test. If the pressure drops more than one (1) psi during the test time, the line will fail the test and the Contractor shall locate the failure, make necessary repairs, and retest the line.
- d. The minimum test time for various pipe sizes and types is as follows:

Nominal Pipe Size (Inches)	Time (Min/100 feet)	
	VCP, RCP	DIP, PVC
6	0.7	5.7
8	1.2	7.6
10	1.5	9.4
12	1.8	11.3
15	2.1	14.2
18	2.4	17.0
21	3.0	19.8
24	3.6	22.8
30	4.8	35.4
36	6.0	51.2
42	7.3	69.5

- e. Required test equipment, including inflatable balls, braces, air hose, air source, time meter, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of \pm two (2) percent shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.
- f. The Contractor shall keep records of all tests made. Copies of records shall be given to the City DWM. Records shall show date, line number and stations, operator, and such other pertinent information to identify the pertinent test data.
- g. The Contractor shall take safety precautions in the performance of the air testing. Plugs shall be properly secured and care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the

sewer line.

2. Individual Joint Test: Pipe joints for sewers thirty (30) inches in diameter and larger shall be air tested individually. The joint tester assembly shall be placed over the joint and the joint area pressurized to four (4) psi. The pressure shall not drop more than two (2) psi in ten (10) seconds. The joint tester assembly shall be equal to Cherne Industries, Inc.

G. Smoke Testing

1. Smoke testing may be used only to locate leaks and in no case shall be considered conclusive or a substitute for air tests, infiltration tests, or exfiltration tests. In all cases a smoke test shall be accompanied by an air test, infiltration test or exfiltration test. The Contractor may order a smoke test if another leakage test fails and the source of the leak cannot be determined by other means. Smoke testing shall only be performed where ground water is low. Smoke shall be blown into a sealed section of sewer under pressure and the Contractor and City DWM shall observe for any smoke appearing on top of the ground indicating the presence of leaks.
2. The City DWM may require that the Contractor excavate the sewer to determine the source of any smoke appearing during the smoke test. All leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the Contractor at his own expense. Equipment and supplies required for smoke tests shall be furnished by the Contractor.
3. The Contractor may perform smoke tests at any time during construction at his option; however, any such tests shall not supplant the final test of the completed work.

H. Deflection Test

1. The Contractor shall test all PVC gravity sewers for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed five (5) percent.
2. The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable manufacturing tolerances of the pipe. The mandrel shall have an odd number of legs, or vanes, with a quantity equal to or greater than nine (9). The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel, aluminum, or other industry accepted material and shall have sufficient rigidity so the legs of the mandrel will not deform when pulled through the pipe. The Contractor shall provide a proving ring for each size mandrel, with a tolerance of no more than 0.02-inch clearance, and the mandrel dimensions shall be checked using this proving ring, before use by the Contractor.
3. The Contractor shall excavate and properly install any section of pipe not passing this test and re-test until results are satisfactory.

4. This test shall be performed twice:
 - a. Once within the first thirty (30) days of installation, and
 - b. Once during final inspection, but no sooner than thirty (30) days after pavement backfill is done, at the completion of this Contract.

I. Dye Testing

1. Dye testing shall be used only to confirm service connection or disconnection and in no case shall be considered conclusive or a substitute for air tests, infiltration tests or exfiltration tests. Dye testing shall only be performed where ground water is low. Dye shall be introduced into the service lateral and the Contractor and City DWM shall observe for any dye appearing on sanitary or storm sewers. Equipment and supplies required for dye tests shall be furnished by the Contractor.
2. The Contractor may conduct dye tests at any time during construction at his option; however, any such tests shall not supplant the final test of the completed work.

J. Closed Circuit Television Inspection

1. The interior of all new gravity sewers shall be subjected to a televised inspection. Such internal inspection shall be conducted and documented in accordance with the requirements of Section 02655.
2. Prior to Final Acceptance the City DWM shall be provided with one copy of the TV inspection report and CD-ROMs showing the entire length of the gravity sewer tested. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, type of joints, roundness and distance between manholes. Any pipe found to be cracked, leaking, misaligned, bellied, or otherwise defective shall be removed and replaced by the Contractor.

3.02 JOINT TESTING PROCEDURES

- A. Joint Testing Procedures: Each sanitary sewer joint shall be individually air tested using a packer or other approved testing device at a test pressure of four (4) psi plus one-half (1/2) psi per vertical foot of depth up to a maximum of ten (10) psi. The packer or testing device shall be positioned within the sanitary sewer so as to straddle the joint to be tested. The ends of the packer or testing device shall be expanded to isolate the pipe joint from the remainder of the sewer and create a void space between the packer or testing device and the pipe joint. The sealing elements shall be inflated with air in accordance with the test equipment manufacturer's instructions. Air shall then be introduced into the void space until the required test pressure is recorded on the void pressure meter. If the required test pressure cannot be developed, the joint will fail the test. After the void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the pressure holds or drops less than two (2) psi in fifteen (15) seconds, the joint is acceptable.

1. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation by the City DWM. The void pressure data shall be transmitted electronically from the void to the monitoring equipment.
2. Prior to starting the sanitary sewer joint testing, a two (2) part control test shall be performed as follows:
 - a. A demonstration test shall be performed in a test cylinder constructed in such a manner that a minimum of three (3) known leak sizes (0.062, 0.094, 0.125 inch diameter) can be simulated. During the demonstration test, the Contractor shall use a test cylinder gauge to measure void pressure. The Contractor shall also install the void pressure monitoring equipment in the same manner as will be done to measure the void pressure at a sanitary sewer joint. The Contractor shall then apply pressure to the void space. During the demonstration test, the void pressure reading on the test cylinder gauge shall be the same as that observed on the void pressure monitoring equipment at all times during the test. If the pressure reading on the test cylinder gauge is not the same as the pressure reading observed on the void pressure monitoring equipment at all times, the Contractor shall repair or otherwise modify the packer or testing device and perform the test until the results are satisfactory to the City DWM. The demonstration test may be required, by the City DWM, at any other time during the joint testing work.
 - b. Upon entering each manhole to manhole section with the test equipment, but prior to the commencement of joint testing, the packer or testing device shall be positioned on a section of sound sanitary sewer between pipe joints. The Contractor shall then perform the test at the required pressure.
3. During the sanitary sewer joint testing work, the Contractor shall keep the following records:
 - a. Manhole to manhole section tested.
 - b. Test pressure used.
 - c. Location (footage) of each joint tested.
 - d. Test results for each joint tested.

B. Lamping Procedures: Lamping will be performed on all sewer pipelines by the Contractor.

3.03 MANHOLE TESTING

- A. All new manholes, rehabilitated manholes, manhole inserts and replacement manholes shall be tested by the Contractor using the vacuum test method, following the manufacturer's recommendations. Vacuum testing of manholes and structures shall be performed after curing of linings and installation of inserts. Any leakage in the manhole or structure, before, during, or after the test shall be repaired at no cost to the City DWM.

B. Prior to testing manholes for watertightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and braced.

C. Vacuum Tests:

1. The manhole, after preparation as noted above, shall be vacuum tested. All testing shall be performed in accordance with the requirements of ASTM C1244. A vacuum shall be drawn and the vacuum drop over a specified time period shall be used to determine the acceptability of the manhole.
2. The test head shall be placed at the inside of the top of the manhole in accordance with the manufacturer's instructions. A vacuum of ten (10) inches of mercury [five (5) psi] shall be drawn on the manhole, the valve on the vacuum line of the test head closed and the vacuum pump shut off. The time shall be measured for the vacuum to drop from ten (10) inches of mercury [five (5) psi] to nine (9) inches of mercury [four and one-half (4.5) psi]. The manhole shall pass the vacuum test if the time for the vacuum reading to drop from 10-inches of mercury to 9-inches of mercury meets or exceeds the values indicated in the table below.

MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS				
	Manhole Diameter (Inches)			
	48	60	66	72
Depth (Feet)	Time (Seconds)			
8	20	28	29	33
10	25	33	36	41
12	30	39	43	49
14	35	48	51	57
16	40	52	58	67
18	45	59	65	73
20	50	65	72	81
22	55	72	79	89
24	59	78	87	97
26	64	85	94	105
28	69	91	101	113
30	74	96	108	121

D. For manholes less than 8-feet in depth, the minimum value listed shall be used.

E. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout. Retesting shall proceed until a satisfactory test is obtained.

F. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.

- G. The City DWM reserves the right to have third party consultants perform construction materials testing and assessments to any new manhole.

3.04 ALLOWABLE TESTING LIMITS FOR SANITARY SEWERS

- A. No infiltration and exfiltration of ground water or other leakage into or out of the sewer shall be allowed during the twenty-four (24) hour test period.
- B. Any visible or audible leaks into the sewer shall be repaired or corrected in accordance with industry standard methods.

+++ END OF SECTION 02650 +++

**SECTION 02655
SEWER SYSTEM CLEANING AND TELEVISION INSPECTION**

PART 1 GENERAL

1.01 SCOPE

The Contractor shall furnish all labor, materials, equipment and incidentals required to complete all sewer system cleaning and television inspection.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents. In addition, the following specific information shall be provided:
1. The Contractor shall provide to the City DWM the following information in writing prior to the set deadline, or at the indicated frequency, whichever is applicable.

Type of Submittal	Time/Frequency of Submittal
Experience Record of Contractor/Subcontractor	At Preconstruction Conference
Listing of Safety Precautions and Traffic Control Measures	At Commencement
Listing of CCTV and Sonar Equipment	At Commencement
Manufacturers Details of CCTV and Sonar Equipment	At Commencement
Internal Sewer Inspection Project Schedule	At Preconstruction Conference
Listing of Cleaning Equipment & Procedures	At Commencement
Listing of Flow Diversion Procedures	At Commencement
Listing of Preconditioning Procedures	At Commencement
Listing of Backup and Standby Equipment	At Commencement
Location where Debris from Cleaning will be Disposed	At Commencement
Updated Schedule of Planned Inspections/Cleaning of Sewer Reaches	Post Commencement and Weekly

Two (2) copies of CCTV and Sonar findings (2 hard copies of fully detailed logs incorporating a summary statistical breakdown of defects and main findings, two (2) electronic discs of fully detailed logs and CD-ROMS of video output)	One (1) week After Completion of Section
Daily Logs and Progress Reports	Daily
Confined Space Entry Logs	Daily

2. Daily reports and weekly reports survey shall be e-mailed to the City DWM.
3. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
 - a. Delays: Dense traffic, lack of information, sickness, labor, or equipment shortage, etc.
 - b. Weather: Conditions, e.g. rain, sunny, windy, etc.
 - c. Equipment: On site, e.g. specialty cleaning, by-pass equipment, etc.
 - d. Submittals: To the City DWM.
 - e. Personnel: On site by name, e.g., all labor, specialty services, etc.
 - f. Accident: Report, e.g. all injuries, vehicles, etc.
 - g. Incident: Report, e.g. damage to property, property owner complaint, etc.
 - h. Major defects encountered, including collapsed pipe, if any: Cave-ins, sink holes, etc.
4. The City DWM shall certify receipt of the daily record noting any items and adding any observations with reference to claims for payment to the Contractor. The City DWM may at his discretion, for which the Contractor must receive direction in writing, provide for an exception to this requirement for weekly submission of progress rather than for daily submission.

1.03 GENERAL

- A. Internal sewer condition assessment shall be used to determine the structural and service condition of sewers prior to abandonment, preconditioning or rehabilitation. Assessment shall be performed using pan and tilt color camera CCTV. In those circumstances where depth of flow is too great for CCTV, Sonar or a combination of Sonar and CCTV shall be used.
- B. Internal sewer condition assessment shall also be used to inspect newly constructed sewers and to survey individual sewer lines that have been preconditioned to further assess condition and record findings.

- C. It is the responsibility of the Contractor to comply with OSHA regulations, the City of Atlanta’s Safety Guidelines, and the City of Atlanta’s Confined Space entry Guidelines as applicable. The Contractor shall provide written documentation that all workers have received the training required under these regulations and guidelines.
- D. Two forms of internal condition assessment are required as part of this Contract as follows:
 - 1. Sewer Survey: Detailed viewing of the sewer (“survey”) either manually or with the aid of CCTV and/or Sonar equipment, to assess internal structural condition, service condition, and identify and locate miscellaneous construction features as well as assess the structural and service condition of laterals. Data logging shall be required.
 - 2. Sewer Inspection: Viewing the sewer (“pull-through”) pursuant to investigative work possibly incorporating a radio-sonde transmitter for locating purposes and/or following other operational activity including:
 - a. Locating manhole(s) and/or lateral(s) with or without radio-sonde.
 - b. Sewer preconditioning and cleaning activities.
 - c. Sewer rehabilitation including point repairs.
 - d. Such other similar purposes as may be required by the City DWM.
- E. Sewer inspection shall be carried out manually or with the aid of CCTV and/or Sonar equipment, to assess overall condition. Data logging shall not be required.

1.04 REQUIREMENTS AND EXTENT OF SURVEY/INSPECTION

- A. The Contractor shall survey and/or inspect pipelines with color pan and tilt CCTV imagery and sonar and or combined color pan and tilt CCTV/Sonar (TISCIT) as specified so as to record all relevant features and to confirm their structural and service condition. Surveys/inspections of pipelines shall be carried out in accordance with the reporting format determined by the City DWM. A sample report sheet is attached to this section (Attachment A) and includes the recording of both target total length of sewer surveyed/inspected between manholes as well as actual length surveyed/inspected.
- B. All CCTV/Sonar operator(s) responsible for direct reporting of sewer condition shall have a minimum of three (3) years previous experience in surveying, processing, and interpretation of data associated with CCTV and Sonar surveys/inspections. The Contractor shall provide the City DWM with written documentation that all CCTV and Sonar survey operators meet these experience requirements. Documentation shall include a list of projects undertaken as well as client name and telephone number for reference.
- C. The Contractor shall provide certification indicating that all personnel have undergone training prior to undertaking internal condition assessment work. Defect Coding, as well as Material, Shape, and Lining Coding used throughout this Project shall conform to the attached listing (Attachment B). General inspection logging requirements are also

included with this section (Attachment C). Training will be carried out at the Contractor's expense.

- D. The Contractor shall complete a daily written record detailing the Work carried out as described in this section.

1.05 FIELD SUPERVISION BY CONTRACTOR

The Contractor shall maintain on the site of the Work at all times a competent field supervisor in charge of the Survey/Inspection. The field supervisor shall be responsible for the safety of all workers and site conditions as well as ensuring that all work is conducted in conformance with the requirements of these specifications and to the level of quality specified.

1.06 APPLICATION OF INSPECTION TYPE

- A. The following guidelines concerning the use of CCTV and Sonar shall be followed:
 1. CCTV alone shall be used for internal condition assessment where the depth of flow of wastewater is less than twenty-five (25) percent of overall sewer diameter at the start of the survey. The Contractor shall make an informed decision to continue should the depth of flow increase beyond the twenty-five (25) percent level but no greater than forty (40) percent of pipe diameter at any time throughout the length.
 2. CCTV combined with Sonar shall be used for internal condition assessment where depth of flow of wastewater varies from twenty-five (25) percent to seventy-five (75) percent of overall sewer diameter for sewers greater than twenty-four (24) inches in diameter. Where the sewer is less than twenty-four (24) inches in diameter and depth of flow of wastewater exceeds twenty-five (25) percent but is less than seventy-five (75) percent of pipe diameter the Contractor shall either: (a) continue using CCTV (where depth of flow is only marginally greater than twenty-five (25) percent of pipe diameter) or (b) use Sonar (by damming or plugging the sewer so that the depth of flow exceeds seventy-five (75) percent of pipe diameter).
 3. Sonar alone shall be used where depth of flow in the sewer exceeds seventy-five (75) percent of pipe diameter and the level of the flow will be artificially increased, without the risk of flooding, to ensure that the pipe is completely surcharged.

1.07 RESPONSIBILITY FOR OVERFLOWS OR SPILLS

- A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidence of overflows or spills of wastewater from the sewer system.
- B. In the event that the Contractor's activities contribute to overflows or spills, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the

spillage, disinfect the area affected by the spill, and notify the City DWM in a timely manner.

- C. The Contractor shall indemnify and hold harmless the City DWM for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the City in defending such fines and claims.

PART 2 PRODUCTS

2.01 SURVEY/INSPECTION UNITS

The Contractor shall provide sufficient survey/inspection units and all relevant ancillary equipment, including standby units in the event of breakdown, in order to complete all sewer and manhole surveys/inspections as specified in this section.

2.02 SURVEY/INSPECTION VEHICLE

- A. The survey/inspection vehicle shall comprise two totally separate areas.
- B. One area shall be designated as the viewing area and shall be insulated against noise and extremes in temperature, shall be air conditioned and shall be provided with means of controlling external and internal sources of light in a manner capable of ensuring that the monitor screen display is in accordance with the requirements of this section. Seating accommodation shall be provided to allow two (2) people, in addition to the operator, to view clearly the on-site monitor, which shall display the survey/inspection as it proceeds.
- C. The second area shall be a working area and shall be reserved for equipment, both operational and stored. No equipment utilized within the sewer shall be allowed to be stored in the viewing area.

2.03 CCTV SURVEY/INSPECTION AND OPERATIONAL EQUIPMENT REQUIREMENTS

- A. The surveying/inspecting equipment shall be capable of surveying/inspecting a length of sewer up to at least one-thousand five-hundred (1500) feet when entry onto the sewer may be obtained at each end and up to one-hundred (100) feet by rodding or up to seven-hundred and fifty (750) feet where a self-propelled unit is used, where entry is possible at one (1) end only. The Contractor shall maintain this equipment in full working order.
- B. Each survey/inspection unit shall contain a means of transporting the CCTV camera and/or Sonar equipment in a stable condition through the sewer under survey and/or inspection. Such equipment shall ensure the maintained location of the CCTV camera or Sonar equipment when used independently on or near to the central axis of a circular shaped sewer when required in the prime position.

- C. Where the CCTV camera and/or Sonar head are towed by winch and bond through the sewer, all winches shall be stable with either lockable or ratcheted drums. All bonds shall be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or Sonar equipment. All winches shall be inherently stable under loaded conditions.
- D. Each unit shall carry sufficient numbers of guides and rollers such that, when surveying or inspecting, all bonds are supported away from pipe and manhole structures and all CCTV/Sonar cables and/or lines used to measure the CCTV camera's/Sonar head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.
- E. Each unit shall carry a range of flow control plugs or diaphragms for use in controlling the flow during the survey/inspection. A minimum of one (1) item of each size of plug or diaphragm ranging from six (6) inches to two (2) feet diameter inclusive shall be carried.
- F. Each survey/inspection unit shall have on call equipment available to carry out the flushing, rodding, and jetting of sewers when such procedures are deemed to be necessary.

PART 3 EXECUTION

3.01 CLEANING PRIOR TO INTERNAL CONDITION INSPECTION

- A. Cleaning of sewer prior to internal inspection will be determined by the Contractor.

3.02 SEWER CLEANING UNITS AND EQUIPMENT

- A. The Contractor shall provide sufficient sewer cleaning units and equipment, including standby units in the event of breakdown, in order to complete cleaning operations as specified.

3.03 CLEANING OF SEWERS

- A. Cleaning means the removal and extraction of silt, debris, and obstructions from the sewer which actually prevent entry and use of CCTV equipment, or the completion of the sewer run and/or manned-entry inspection of sewers, or which is specifically requested by the Contractor. In general cleaning shall not be required as part of the internal condition inspection service unless specifically instructed by the Contractor.
- B. No cleaning shall be required prior to:
 - 1. Sonar surveys or Sonar combined with CCTV surveys, or Sonar inspections or Sonar combined with CCTV inspections unless specifically instructed.

2. Internal inspection completed following construction and testing of new sewers.

3.04 EXTENT OF CLEANING

- A. Cleaning shall be required for existing lines to the extent indicated on the Drawings.
- B. The Contractor shall:
 - 1. Provide and/or manage the equipment necessary for proper jetting, rodding, bucketing, brushing, root cutting, flushing, and vacuum uplift or any other approved removal and extraction system necessary to remove and extract silt, debris, and obstructions from the sewer which would otherwise preclude use of CCTV equipment and/or manned-entry inspection of the sewers.
 - 2. Demonstrate the performance capabilities of the cleaning equipment and method for use when requested by the Contractor. If results obtained by the demonstration are not satisfactory, the Contractor shall select other methods or equipment that will clean the sewer line and repeat the demonstration.
 - 3. Install a gauge to monitor working pressure on the discharge of high-pressure pumps for jetting equipment.
 - 4. Provide more than one (1) type of equipment or attachments on a single reach or at a single location as required.
- C. The Contractor shall exert all reasonable care to avoid damage to the sewer or manhole during the cleaning operation. Mechanical equipment used for cleaning shall be equipped with an overload clutch to limit the risk of damage to the pipe.

3.05 REMOVAL OF DEBRIS WITH CLEANING

The Contractor shall provide all equipment and personnel necessary to safely remove and extract silt and debris from the sewer through existing manhole access, load it onto trucks for disposal, and dispose of the silt and debris at approved sites.

3.06 CCTV/SONAR - GENERAL

- A. CCTV Camera/Sonar Head Prime Position: The CCTV camera/sonar head shall be positioned to reduce the risk of picture distortion. In circular sewers the CCTV camera lens and/or Sonar head shall be positioned centrally (i.e. in prime position) within the sewer. In non-circular sewers, picture orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera lens/sonar head shall be positioned looking along the axis of the sewer when in prime position. A positioning tolerance of $\pm 10\%$ of the vertical sewer dimension shall be allowed when the camera is in prime position.

- B. CCTV Camera/Sonar Head Speed: The speed of the CCTV camera in the sewer shall be limited to eight (8) inches per second for surveys to enable all details to be extracted from the ultimate CD-ROM recording. The speed of scanning Sonar shall be limited to four (4) inches per second.
- C. CCTV Color Camera: The Contractor shall provide a color pan and tilt camera(s) to facilitate the survey and inspection of all laterals, including defects such as hydrogen sulfide corrosion in the soffit of sewers and benching or walls of manholes over and above the standard defects that require reporting, where appropriate in accordance with industry standards. These will be carried out as part of the normal CCTV assessment as the survey or inspection proceeds. A three-hundred sixty (360) degrees rotational scan indicating general condition must be implemented at every fifty (50) feet interval (min.) along sewers, and at manholes and any salient, specified, defect features. The tilt arc must not be less than two-hundred twenty-five (225) degrees.
- D. Linear Measurement:
1. The CCTV/Sonar monitor display shall incorporate an automatically updated record in feet and tenths of a foot of the footage of the camera or center point of the transducer, whichever unit is being metered, from the cable calibration point. The relative positions of the two (2) center points shall also be noted.
 2. The Contractor shall use a suitable metering device, which enables the cable length to be accurately measured; this shall be accurate to $\pm 1\%$ or three (3) inches whichever is the greater.
 3. The Contractor shall demonstrate compliance with the tolerances in this section, using one or both of the following methods in conjunction with a linear measurement audit form which shall be completed each day during the survey:
 - a. Using of a cable calibration device.
 - b. Tape measurement of the surface between manholes.
 - c. A quality control form will be completed and submitted by the Contractor depicting the level of accuracy achieved.
 4. If the Contractor fails to meet the required standard of accuracy, the City DWM shall instruct the Contractor to provide a new device to measure the footage. The City DWM retains the right to instruct the Contractor in writing, to re-survey those lengths of the sewer first inspected with the original measuring device using the new measuring device.
- E. Data Display, Recording, and Start of Survey/Inspection:
1. At the start of each sewer length being surveyed or inspected and each reverse set-up, the length of pipeline from zero (0) footage, the entrance to the pipe, up to the cable

calibration point shall be recorded and reported in order to obtain a full record of the sewer length. Only one (1) survey shall be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes shall be logged on a separate log. Video digits shall be recorded so that every recorded feature has a correct tape elapsed time stamp. Each log shall make reference to a start (ST) and finish (FH) manhole unless abandonment took place because of blockage. Manhole number shall be indicated in the remark's column of the detail report. Surveys must not extend over two (2) tapes.

2. The footage reading entered on to the data display at the cable calibration point must allow for the distance from the start of the survey/inspection to the cable calibration point such that the footage at the start of the survey is zero (0).
3. In the case of surveying through a manhole where a new header sheet must be completed, the footage shall be set at zero (0) with the camera focused on the outgoing pipe entrance.
4. At the start of each manhole length a data generator shall electronically generate and clearly display on the viewing monitor and subsequently on the CD-ROM recording a record of data in alpha-numeric form containing the following minimum information:
 - a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).
 - b. Sewer dimensions.
 - c. Manhole/pipe length reference numbers.
 - d. Date of survey.
 - e. Road name/location.
 - f. Direction of survey.
 - g. Time of start of survey.
 - h. Sewer use (SS - Sanitary Sewer, CS - Combined Sewer, ST - Storm Sewer).
 - i. Material of construction of the pipe.
5. The size and position of the data display shall be such as not to interfere with the main subject of the picture.
6. Once the survey of the pipeline is under way, the following minimum information shall be continually displayed:
 - a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).
 - b. Sewer dimensions in inches.
 - c. Manhole or pipe length reference number (PLR). General convention allows upstream manhole number to be designated PLR.
 - d. Direction of survey, i.e., downstream or upstream.

7. Correct adjustment of the recording apparatus and monitor shall be demonstrated by use of the test tape or other device approved by the Contractor. Satisfactory performance of the camera shall be demonstrated by the recording of the appropriate test device at the commencement of each day for a minimum period of thirty (30) seconds.
 8. Footage and corresponding time elapsed video digit shall be given throughout survey/inspection for all relevant defects and construction features encountered unless otherwise agreed.
 9. Where silt encountered is greater than ten (10) percent of the diameter of the pipe, the depth of silt shall be measured and recorded at approximately fifty (50) foot intervals.
 10. CD-ROM capacity shall be adequate to record two (2) hours of video inspection. Recording of a single segment shall not extend over more than one (1) video tape. No unrecorded gaps shall be left in the recording of a segment between surveys/inspections as the original video tape.
 11. Only segments between manholes on the same sewer reach or basin shall be included on one (1) CD-ROM. There shall be no "split surveys" or "split-basins" between CD-ROMs.
 12. All continuous defects shall incorporate a start and finish abbreviation in the log report.
- F. Coding: Defect Coding, as well as material, shape, and lining coding, and conventions used will be provided by the Contractor. The Contractor shall ensure that all surveyors conform to the detailed requirements of the reporting procedure concerning feature description and feature definition as well as the Sewer.Dat computer file format attached. An example Sewer.Dat Data File is presented in Attachment D.

3.07 MAN ENTRY SURVEY - GENERAL

- A. Photographic Camera Position - General Illustration of Sewer Interior:
1. The hand-held photographic camera or CCTV camera shall be positioned to reduce the risk of picture distortion. In circular sewers the camera lens shall be positioned centrally looking along the axis of the sewer. In non-circular sewers picture orientation shall be taken at mid-height, unless otherwise agreed, and centered horizontally.
 2. The hand held photographic camera or CCTV camera shall be positioned so that the long side of the photograph or CD-ROM frame is horizontal.
- B. Photographic Camera Position - Laterals/Specific Defect:

1. A means of accurately locating the photographic or camera's footage and any recorded lateral or defect, along the sewer shall be provided, to an accuracy of $\pm 1\%$ or six (6) inches whichever is greater. When requested by the City DWM in writing at any time during a survey or inspection, the Contractor shall demonstrate compliance with this tolerance.
 2. The device used by the Contractor to measure the footage along the sewer will be compared with a standard tape measure. The results will be noted. If the Contractor fails to meet the required standard of accuracy, the City DWM shall instruct the Contractor to provide a new device to measure the footage. The City DWM retains the right to instruct the Contractor in writing to re-survey those lengths of sewer inspected with the original measuring device at no extra cost.
- C. Photographic Quality: The in-sewer photographic camera or hand held CCTV system and suitable illumination shall be capable of providing an accurate, uniform and clear record of the sewer's internal condition. In-sewer lighting standards shall meet the requirements of applicable codes regarding safety and power.

3.08 CCTV, MAN ENTRY AND SONAR SURVEY DATA SPECIFICATION

A. Survey Reporting:

1. No later than fourteen (14) days following the completion of a pipeline survey/inspection, the Contractor shall submit to the City DWM two (2) hard copies of all details, i.e. typed reports including summary statistical breakdown of all defects encountered, two CDE-ROMs containing the data transfer file and two CD-ROMs shall be submitted to the City DWM. The supplied data and information shall remain the property of the City DWM.
2. The report shall be computer validated using AMPS/EXAMINER software, or equivalent and presented in electronic format acceptable to the City DWM to provide a summary listing of the number and type of features including defects found for each section of pipeline. The report format is shown in the attached specimen report. This specimen report sheet shall be accurately and fully adopted in style, format, and detail.
3. When requested by the City DWM, the Contractor shall provide hard copy output or manually completed coding sheets at the time of the survey and shall forward copies of these sheets to the City DWM, preferably each day, but at least every other day, together with a daily report on progress.

- B. Site Coding Sheets: Each sewer length, i.e. the length of sewer between two (2) consecutive manholes, shall be entered on a separate coding sheet or entered separately electronically. Thus where the Contractor elects to "pull through" a manhole during a CCTV and/or Sonar Survey or "walk through" during a "Man Entry" survey, a new coding sheet shall be started at the manhole "pulled or walked through" and the footage re-set to zero (0) on the coding sheet. Where a length of sewer between consecutive

manholes is surveyed from each end (due to an obstruction) two (2) coding sheets shall be used. Where a length of sewer between two (2) consecutive manholes cannot be surveyed or attempted for practical reasons a (complete header) coded sheet shall be made out defining the reason for abandonment. At uncharted manholes a new coding sheet shall be started and the footage re-set to zero (0).

C. Measurement Units: All dimensions shall be in feet and inches. Measurement of sewers shall be to the nearest inch.

D. CCTV and Man-Entry Photographs:

1. Photographs shall be taken of all defective laterals and pipeline defects where requested in writing. Where a defect is continuous or repeated the photographs shall be taken at the beginning of the defect and at not less than ten (10) foot intervals thereafter. Where photographs are not otherwise required a general condition photograph shall be taken not more than fifty (50) feet after the previous photograph.
2. CCTV photographs must clearly and accurately show what is displayed on the monitor, which shall be in proper adjustment.
3. Photographs shall be supplied in an electronic format suitable to the City DWM and shall be identified in relation to the photograph number (cross referenced to the site survey sheet) street location, sewer dimensions, manhole start and finish numbers, survey direction, footage and date when the photograph was taken.
4. The annotation shall be clearly visible and in contrast to its background, shall have a figure size no greater than fourteen (14) point, and be type printed in upper case.
5. The annotation shall be positioned so as not to interfere with the subject of the photograph.

E. Control Sample Photographs and/or Electronic Files: The City DWM may issue a written instruction to the Contractor to provide a sample of the photographs and/or CCTV/Sonar tapes taken during the contract period which the Contractor shall provide within five (5) working days of receiving the written instruction.

3.09 CCTV/SONAR PERFORMANCE

A. Color CCTV/Sonar: All CCTV and/or Sonar work shall use color CCTV/Sonar reproduction.

B. CCTV Picture Quality:

1. An approved test device shall be provided and be available on the site of the Work throughout the Contract, enabling the tests specified in this clause to be checked.

2. The test card shall be Marconi Regulation Chart No. 1 or its approved derivatives with a color bar, clearly differentiating between colors, with no tinting, to show the following: White, Yellow, Cyan, Green, Magenta, Red, Blue, and Black.
 3. At the start of each and every working shift, the camera shall be positioned centrally and at right angles to the test card at a distance where the full test card just fills the monitor screen. The Contractor shall ensure that the edges of the test card castellations coincide with the edges of the horizontal and vertical scan (raster). The card shall be illuminated evenly and uniformly without any reflection. The illumination shall be to the same color temperature as the color temperature of the lighting that recorded for subsequent use by the City DWM, the recording time shall be at least thirty (30) seconds. The type of camera used shall be identified on the test recording. The recording must show the camera being introduced into the test device and reaching its stop position.
- C. Shades of Gray: The gray scale shall show equal changes in brightness ranging from black to white with a minimum of five (5) clearly recognizable stages.
- D. Color: With the monitor adjusted for correct saturation, the six (6) colors plus black and white shall be clearly resolved with the primary and complementary colors in order of decreasing luminance. The gray scale shall appear in contrasting shades of gray with no tint.
- E. Linearity: The background grid shall show squares of equal size, without convergence/divergence over the whole picture. The center circle shall appear round and have the correct height/width relationship ($\pm 5\%$).
- F. Resolution: The live picture shall be clearly visible with no interference and capable of registering a minimum number of TV lines/pictures height lines. The resolution shall be checked with the monitor color turned down. In the case of tube cameras this shall be six-hundred (600) lines.
- G. Color Constancy:
1. To ensure the camera shall provide similar results when used with its own illumination source, the lighting shall be fixed in intensity prior to commencing the survey. In order to ensure color constancy, generally no variation in illumination shall take place during the survey.
 2. The Contractor shall note that the City DWM may periodically check both the live and picture color consistency against the color bar. Any differences will require re-survey of the new length or lengths affected, at the Contractor's expense.
- H. Playback and CD-ROM Labeling:

1. CD-ROM playback imaging shall be linked to electronic output of alpha-numeric data so that if necessary direct interrogation of database can take place with simultaneous viewing of CCTV/Sonar images.
 2. Each CD-ROM disc shall be labeled by reference to the header record for the survey section completed together with the following information:
 - a. Sequential (unique) CD-ROM number.
 - b. Basin/catchment worked in.
 - c. Survey company name and logo.
 - d. Survey date.
- I. CCTV Focus/Iris/Illumination: The adjustment of focus and iris shall allow optimum picture quality to be achieved and shall be remotely operated. The adjustment of focus and iris shall provide a minimum focal range from six (6) inches in front of the camera's lens to infinity. The distance along the sewer in focus from the initial point of observation shall be a minimum of twice the vertical height of the sewer. The illumination must allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing.
- J. Sonar Survey Requirements:
1. Unit rates shall allow for:
 - a. Complete structural and service assessment to the equivalent standard as that obtained through conventional CCTV imagery.
 - b. The means of attenuating flow, where necessary, to facilitate appraisal of the full sewer cross section.
 - c. Measurement of flow depth and silt depth.
 2. Rates shall allow for continuous output on conventional annotated CD-ROM format of all sewers surveyed, supported by complete defect code sheets. Additionally, silt levels shall be assessed as a percentage depth of sewers at twenty-five (25) foot intervals for each pipeline surveyed. To facilitate this requirement, and in addition, to assist in diametrical measurement particularly where a sewer is deformed and/or where a sewer has suffered hydrogen sulfide corrosion; screen graphic facilities shall be made available to enable measurements to be taken in any position across the diametrical profile of the sewer as the Sonar survey proceeds and where specifically directed by the Contractor.
 3. Where combined CCTV and Sonar imagery is required the output shall display combined CCTV and Sonar images of the sewer being surveyed. The Sonar image shall be superimposed on the real CCTV image as a combined operation.
 4. Unit rates shall allow for a comprehensive final report on the findings concerning major defects, including fractures, displaced joints, deformation, corrosion, and

lateral intrusions, as well as dominant surface features, including encrustation and silt depths.

5. The monitor display resolution shall be a minimum of 512 x 512 pixels. The color palette shall have a minimum of sixteen (16) colors with text.
6. The picture update speed shall not compromise compliance with paragraph A (1) or result in unsatisfactory picture resolution.
7. The range of resolution shall be $\pm \frac{1}{10}$ inch.
8. The maximum beam width of Sonar energy pulse shall be no greater than two (2) degrees from the center of the transducer.
9. The transducer shall be of the continuous scanning type.

K. Contractor's Data Quality Control Procedure:

1. The Contractor shall operate a quality control system, , which will effectively gauge the accuracy of all survey reports produced by the operator.
2. The system shall be such that the accuracy of reporting is a function particularly of:
 - a. The number of faults not recorded (omissions).
 - b. The correctness of the coding and classification of each fault recorded.
3. The minimum levels of accuracy to be attained under the various survey headings are as follows:
 - a. Header Accuracy: ninety-five (95) percent.
 - b. Detail Accuracy: eighty-five (85) percent.

L. The Contractor's data quality control program shall include routine outside auditing of the work completed by a qualified subcontractor. The qualified subcontractor shall meet the minimum specified Contract requirements for the performance of the Work and shall be approved in writing by the Contractor. The accuracy of the Contractor's data shall be based on the percentage of the data confirmed correct by the subcontractor. The minimum acceptable accuracy of the data shall be eighty-five (85) percent. The general sequence of the auditing shall be as follows:

1. The City DWM shall randomly select one (1) day per month, typically in the first week of the month, and the work performed during this day shall be reviewed and/or repeated by the qualified subcontractor.
2. If the work is greater than or equal to eighty-five (85) percent accurate, no further outside auditing will be required for the month unless requested by the City DWM at his sole discretion.

3. If the work is less than eighty-five (85) percent accurate, the Contractor shall at its own expense repeat and/or correct the work and have the work re-audited by the qualified subcontractor.
4. If the work is still less than eighty-five (85) percent accurate, the Contractor shall repeat and/or correct and have the work re-audited, at its own expense, until the work is greater than or equal to eighty-five (85) percent accurate.
5. When this re-audited work is found to be greater than or equal to eighty-five (85) percent accurate, the Contractor shall have the work of another randomly selected day in the same month reviewed and/or repeated by the qualified subcontractor at the Contractor's own expense.
6. Steps 2 through 5 shall be repeated at the Contractor's own expense until the selected day is eighty-five (85) percent accurate on the initial audit.
7. The occurrence of five (5) randomly selected days not achieving eighty-five (85) percent accuracy on initial subcontractor review will constitute cause for dismissal.
8. If the Contractor successfully meets the eighty-five (85) percent accuracy requirement for the initial randomly selected day for two (2) consecutive months, the Contractor may subsequently audit one (1) day every other month. The Contractor may continue auditing one (1) day every other month until the initial randomly selected day does not meet eighty-five (85) percent accuracy, at which time it must resume auditing one (1) day every month.

3.10 COLLAPSED SEWERS/DEFECTIVE MANHOLES

- A. Any sewer found with greater than ten (10) percent deformation (i.e. collapsed or near to collapse) shall be reported to the City DWM immediately for remedial action. In the event of emergency the Contractor shall call (404)-65-WORKS.
- B. Any manhole found broken, cracked, with missing covers or surcharged, shall be reported to the City DWM immediately for remedial action. In the event of emergency the Contractor shall call (404)-65-WORKS.
- C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be protected by the Contractor until the City DWM arrives at the site of the Work. In the event of emergency the Contractor shall call (404)-65-WORKS.
- D. Any manhole found where the existing conditions pose a threat of personal injury to the public, such as broken, cracked, or missing covers or covers found in traveled portions of any sidewalk or roadway shall be protected by the Contractor until the City DWM arrives at the site of the Work. In the event of emergency the Contractor shall call (404)-65-WORKS.

3.11 TRAFFIC CONTROL

- A. The Contractor shall control traffic in accordance with the requirements of Section 01550.

ATTACHMENT A

**INTERNAL SEWER CONDITION ASSESSMENT
SAMPLE REPORTS**

(For use with City DWM of Atlanta Database)

SURVEY REPORT		Page Number : 167				
Date : 02 05 2000		Time : 10:28				
Contractor	Contract No	Job No	Drainage Area	Div Dist	Pipe L. Ref	
ASI/DG	ASG/0001	0	0	0 000	23250201501X	
Location		Place Name				
BERKELE STREET		MCDANIEL BASIN				
Start Manhole No.	: 23250201001	Depth :	08.0	Total Length :	365.0	
Finish Manhole No.	: 23250201501	Depth :	09.0	Suyed Length :	280.7	
Use	Direction	Size	Shape	Material	Lining Yr Laid	Pipe L
COMBINED	UPSTREAM	8in	CIRC.	U. CLAY	Z	3.00
CD-ROM No	U. Model	Comments				
00016		-				
Purpose	Weather	Location	Further Information			
	DRY		-			

DETAIL		Page Number : 167	
Digit Ph.	Dist CD	Code	Other Details

0136	0.0	ST	Start of Survey		[0065]
0280	0.0	MH	Manhole 23250201001		
0560	0.0	WL	Water Level is now 05%		
0163	30.2	JN	Junction. 6in at 03o/c	FW	
0180	41.6	JDM	Joint Displaced Medium		
0186	43.3	JN	Junction. 6in at 09o/c	SW	
0200	54.6	OJM	Open Joint Medium		
0203	56.3	JN	Junction. 6in at 09o/c	SW	
0226	79.0	JN	Junction. 6in at 03o/c	FW?	
0236	83.2	JN	Junction. 6in at 09o/c	FW	
0260	106.5	JN	Junction. 6in at 02o/c	FW?	
0270	108.5	JN	Junction. 6in at 09o/c	FW	
0286	120.9	CNI	Conn. Intruding by 1in.	6in Dia at 12o/c	FW
0303	135.4	CL	Longitudinal Crack at 12o/c		
0310	136.0	CNI	Conn. Intruding by 1in.	6in Dia at 12o/c	FW?
0326	147.2	JN	Junction. 6in at 03o/c	FW	
0333	149.8	JN	Junction. 6in at 09o/c	SW	
0346	157.5	JN	Junction. 6in at 03o/c	SW	
0366	175.9	JN	Junction. 6in at 10o/c	SW	
0376	181.0	JN	Junction. 6in at 02o/c	FW?	
0386	184.9	JN	Junction. 6in at 10o/c	SW	
0780	184.9	S1 DES	Debris Silt. 05% loss		
0416	209.3	JN	Junction. 6in at 10o/c	FW?	
0840	209.3	F1 DES	Debris Silt. 05% loss		
0433	218.9	JN	Junction. 6in at 02o/c	SW	
0453	234.2	JN	Junction. 6in at 10o/c	SW	
0470	244.8	FCJ	Circumferential Fracture at Joint at 03 to 05o/c		
0483	254.7	JN	Junction. 6in at 02o/c	FW?	
0970	254.7	S2 DES	Debris Silt. 05% loss		
1940	254.7	S3 RF	Fine Roots		
0490	257.5	JN	Junction. 6in at 09o/c	SW	
0513	279.5	C2 DES	Debris Silt. 50% loss		
0520	280.6	JN	Junction. 6in at 02o/c	SW	

DETAIL CONTINUED ON NEXT PAGE	For Page Number : 167
-------------------------------	-----------------------

< CONTINUATION PAGE > < Page Number : 167 >

Location BERKELE STREET	Place Name MCDANIEL BASIN	
Start Manhole No. : 23250201001	Depth : 08.0	Total Length : 365.0
Finish Manhole No. : 23250201501	Depth : 09.0	Suyed Length : 280.7

< DETAIL CONTINUED > < Page Number : 167 >

Digit Ph.	Dist	CD	Code	Other	Details
-----------	------	----	------	-------	---------

0523	280.7	F2	DES	Debris	Silt.	50% loss
1050	280.7	F3	RF	Fine	Roots	
0523	280.7	SA		Survey	Abandoned	DUE TO SURVEY OVERLAP

< SUMMARY > < Page Number : 167 >

St Mh No. : 23250201001	Fh Mh No. : 23250201501	Suyed Length : 280.7			
SOME MAJOR defects in this length : Deformations : NO					
Mult/Long/Circ	Heavy/Medium	Gusher/Runner Mass			
Breaks/Holes	Fractures	Encrustation	Infiltration	Roots	Obstructions
NO	NO	NO	NO	NO	NO
CIRC					
Faulty Junctions/Connections : YES					
< END OF SUMMARY >					

SURVEY REPORT		Page Number : 170				
Date : 02 05 2000	Time : 17:20					
Contractor ASI/DG	Contract No ASG/0001 0	Job No 0	Drainage Area 0	Div Dist 0 000	Pipe L. Ref 23250200401X	
Location MCDANIEL STREET		Place Name MCDANIEL BASIN				
Start Manhole No. :	23250201901	Depth :	09.6	Total Length :	085.8	
Finish Manhole No. :	23250200401	Depth :	08.0	Suyed Length :	085.8	
Use	Direction	Size	Shape	Material	Lining Yr Laid	Pipe L
COMBINED	UPSTREAM	12in	CIRC.	U. CLAY	2	3.00
CD-ROM No	U. Model	Comments				
00016	-	-				
Purpose	Weather	Location	Further Information			
-	DRY	-	-			

DETAIL		Page Number : 170	
Digit Ph.	Dist CD Code	Other Details	

0683	0.0	ST	Start of Survey	[0341]
1370	0.0	MH	Manhole 23250201901	
1940	0.0	WL	Water Level is now 05%	
0683	0.0	S1 DEG	Debris Grease at 07o/c to 05o/c. 05% loss	
0693	13.9	JDM	Joint Displaced Medium	
0700	18.3	OB	Obstruction. 05% loss STONE	
0710	26.3	S2 DES	Debris Silt. 05% loss	
0720	35.4	CXI	Conn Defect/Intr. by 3in. 6in Dia. At 10o/c SW	
1440	35.4	JN	Junction. 6in at 02o/c CAPPED OFF	
0736	40.5	JN	Junction. 6in at 02o/c CAPPED OFF	
0750	46.6	C2 DES	Debris Silt. 15% loss	
0766	60.9	JN	Junction. 6in at 10o/c CAPPED OFF	
0783	73.7	JX	Junction. Defective. 6in Dia at 02o/c SW	
1570	73.7	B	Break. From 11o/c to 01o/c	
0796	81.1	JN	Junction. 6in at 10o/c	
0800	85.8	F1 DEG	Debris Grease at 07o/c to 05o/c. 05% loss	
1600	85.8	F2 DES	Debris Silt. 15% loss	
2400	85.8	MH	Manhole 23250200401	
0800	85.8	FH	Finish of Survey.	

SUMMARY		Page Number : 170		
St Mh No. :	23250201901	Fh Mh No. :	23250200401	Suyed Length : 085.8
SOME MAJOR defects in this length :		Deformations : NO		
Breaks/Holes	Mult/Long/Circ	Heavy/Medium	Gusher/Runner	Mass
YES	NO	NO	NO	YES
Faulty Junctions/Connections :		YES		
END OF SUMMARY				

< SURVEY REPORT >						Page Number : 184 >
Date : 02 07 2000			Time : 14:52			
Contractor	Contract No	Job No	Drainage Area	Diu Dist	Pipe L. Ref	
ASI/DG	ASG/0001	0	0	0 000	23350305601X	
Location			Place Name			
GAULT STREET			BOULEVARD BASIN			
Start Manhole No. :	23350305601	Depth :	22.0	Total Length :	501.2	
Finish Manhole No. :	23350315501	Depth :	00.0	Suyed Length :	501.2	
Use	Direction	Size	Shape	Material	Lining Yr Laid	Pipe L
COMBINED D/STREAM		12in	CIRC.	U. CLAY	2	3.00
CD-ROM No	U. Model	Comments				
00017		-				
Purpose	Weather	Location	Further Information			
	DRY		-			

< DETAIL >				Page Number : 184 >
Digit Ph.	Dist	CD Code	Other Details	

0786	0.0	ST	Start of Survey	[0392]
1580	0.0	MH	Manhole 23350305601	
2360	0.0	WL	Water Level is now 05%	
0790	6.0	S1 EMJ	Encrust Med at Jnt. 15% loss at 07o/c to 05o/c CLOCKS VARY	
0800	12.9	EHJ	Encrust Heavy at Jnt. 25% loss at 12o/c to 05o/c	
0810	15.3	IDJ	Infiltration Dripping at Joint at 11o/c to 12o/c	
0816	18.6	EHJ	Encrust Heavy at Jnt. 25% loss at 01o/c to 05o/c	
0823	24.7	CL	Longitudinal Crack at 12o/c	
0830	31.5	FL	Longitudinal Fracture at 12o/c	
0840	43.2	EHJ	Encrust Heavy at Jnt. 30% loss at 07o/c to 05o/c	
0846	46.3	EHJ	Encrust Heavy at Jnt. 25% loss at 07o/c to 05o/c	
1700	46.3	S2 IDJ	Infiltration Dripping at Joint at 12o/c	
2600	46.3	RFJ	Fine Roots at Joint	
0856	50.9	EHJ	Encrust Heavy at Jnt. 50% loss at 09o/c to 03o/c OBSCURING VISION	
0920	87.5	F2 IDJ	Infiltration Dripping at Joint at 12o/c	
0956	147.1	IDJ	Infiltration Dripping at Joint at 12o/c	
0966	161.0	EHJ	Encrust Heavy at Jnt. 25% loss at 09o/c to 03o/c	
1940	161.0	IDJ	Infiltration Dripping at Joint at 11o/c	
3080	161.0	RFJ	Fine Roots at Joint	
0973	166.5	EHJ	Encrust Heavy at Jnt. 25% loss at 08o/c to 12o/c	
0983	171.1	IDJ	Infiltration Dripping at Joint at 11o/c	
0996	194.7	IDJ	Infiltration Dripping at Joint at 11o/c	
1003	202.4	IDJ	Infiltration Dripping at Joint at 01o/c	
1016	213.7	BJ	Break at Joint. From 06o/c to 08o/c	
1026	217.6	IDJ	Infiltration Dripping at Joint at 11o/c to 12o/c	
1033	225.2	IDJ	Infiltration Dripping at Joint at 01o/c	
1050	252.9	F1 EMJ	Encrust Med at Jnt. 15% loss at 07o/c to 05o/c CLOCKS VARY	
1300	252.9	S3 ELJ	Encrust Light at Joint at 07o/c to 05o/c CLOCKS VARY	
1066	286.4	IDJ	Infiltration Dripping at Joint at 12o/c	
1073	296.2	RMJ	Mass Roots at Joint. 30% loss	
1350	296.2	IDJ	Infiltration Dripping at Joint at 02o/c	

DETAIL CONTINUED ON NEXT PAGE	For Page Number : 184
-------------------------------	-----------------------

Location GAULT STREET	Place Name BOULEVARD BASIN
Start Manhole No. : 23350305601	Depth : 22.0 Total Length : 501.2
Finish Manhole No. : 23350315501	Depth : 00.0 Sued Length : 501.2

Digit Ph.	Dist CD	Code	Other Details
-----------	---------	------	---------------

1086	304.2	RMJ	Mass Roots at Joint. 10% loss
1113	349.6	RMJ	Mass Roots at Joint. 65% loss
1130	367.7	RMJ	Mass Roots at Joint. 05% loss
1133	370.7	RMJ	Mass Roots at Joint. 60% loss
1146	375.8	RMJ	Mass Roots at Joint. 05% loss
1150	377.8	S4 RFJ	Fine Roots at Joint
1186	441.6	BJ	Break at Joint. From 09o/c to 12o/c
1193	442.7	B	Break. From 11o/c to 01o/c
1200	444.8	B	Break. From 11o/c to 01o/c REPAIRED
1206	446.3	CCJ	Circumferential Crack at Joint at 07o/c to 09o/c
1213	448.5	B	Break. From 10o/c to 01o/c REPAIRED
1220	451.8	B	Break. From 11o/c to 01o/c REPAIRED
1230	454.7	B	Break. From 10o/c to 12o/c REPAIRED
1240	457.2	B	Break. From 10o/c to 12o/c REPAIRED
1250	460.3	B	Break. From 09o/c to 01o/c REPAIRED
1256	462.1	B	Break. From 10o/c to 01o/c REPAIRED
1266	471.9	B	Break. From 11o/c to 02o/c REPAIRED
1273	478.5	RMJ	Mass Roots at Joint. 25% loss
1750	478.5	RTJ	Tap Roots at Joint
1346	485.1	RMJ	Mass Roots at Joint. 25% loss
1360	492.7	S5 DES	Debris Silt. 10% loss
1370	501.2	F3 ELJ	Encrust Light at Joint at 07o/c to 05o/c CLOCKS VARY
1940	501.2	F4 RFJ	Fine Roots at Joint
3080	501.2	F5 DES	Debris Silt. 10% loss
3760	501.2	MH	Manhole 23350315501
1370	501.2	FH	Finish of Survey.

St Mh No. : 23350305601	Fh Mh No. : 23350315501	Sued Length : 501.2			
SOME MAJOR defects in this length : Deformations : NO					
Breaks/Holes	Fractures	Encrustation	Infiltration	Roots	Obstructions
YES	LONG	HEAVY MEDIUM	NO	MASS	NO
Faulty Junctions/Connections : NO					
< END OF SUMMARY >					

ATTACHMENT B

DEFECT, MATERIAL, SHAPE, AND LINING CODES

DEFECT CODES SORTED ALPHABETICALLY BY CODE		
Code	Type	Definition
B	Structural	Conduit broken at..(OR from ...to...) o'clock
BSV	Structural	Conduit broken with soil visible at .. (OR from ...to...) o'clock
BVV	Structural	Conduit broken with void visible at .. (OR from ...to...) o'clock
CC	Structural	Circumferential crack from ...to... o'clock
CI	Miscellaneous	Camera inverted, top of center line at ...o'clock
CL	Structural	Longitudinal crack at ...o'clock
CM	Structural	Multiple cracks from ...to ...o'clock
CS	Structural	Spiral crack from ...to...o'clock
CU	Miscellaneous	Camera submerged
DAE	Service	Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAES	Service	Light Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAEM	Service	Medium Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAEL	Service	Heavy Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAGS	Service	Debris (grease) ...% cross-sectional loss from ... to ... o'clock
DAR	Service	Debris (ragging) ...% cross-sectional loss from ... to ... o'clock
DAZ	Service	Debris (not silt/grease/ragging)%cross-sectional loss from... to ... o'clock
DB	Structural	Brick displaced atto...o'clock
DC	Service	Deposits, hard/compacted% cross-sectional loss from ... to ... o'clock
DF	Service	Deposits, fine% cross-sectional loss from ... to ... o'clock
DGV	Service	Deposits, gravel% cross-sectional loss from ... to ... o'clock
DH	Structural	Conduit deformed. ... % change of horizontal dimension
DI	Structural	Dropped brick invert, gap ... mm
DIF	Service	Ingressed deposit, (fine) ...%cross-sectional loss from ... too'clock
DIGV	Service	Ingressed deposit, (gravel) ...%cross-sectional loss from ... too'clock
DIP	Service	Ingressed deposit, (peat) ...%cross-sectional loss from ... too'clock
DIS	Service	Ingressed deposit, (sand) ...%cross-sectional loss from ... too'clock
DIZ	Service	Ingressed deposit, (other) ...%cross-sectional loss from ... too'clock
DS	Service	Deposits settled, ...% cross-sectional loss from ... to ... o'clock
DV	Structural	Conduit deformed, ... % change of vertical dimension
DZ	Service	Deposits settled (other), ... % cross-sectional loss from ... to ... o'clock
FC	Structural	Circumferential fracture from ... to ... o'clock
FH	Miscellaneous	Finish on conduit survey length
FL	Structural	Longitudinal fracture at ... o'clock
FM	Structural	Multiple fractures from ... to ... o'clock
FS	Structural	Spiral fracture from ... to ... o'clock
GO	Miscellaneous	General observation
GP	Miscellaneous	General photograph
H	Structural	Hole in sewer at ... (OR from ... to ...) o'clock
HSV	Structural	Hole in sewer w/soil visible at ... (OR from ... to ...) o'clock
HVV	Structural	Hole in sewer w/void visible at ... (OR from ... to ...) o'clock
ID	Service	Infiltration dripper at ... (OR from ... to ...) o'clock
IG	Service	Infiltration gusher at ... (OR from ... to ...) o'clock
IR	Service	Infiltration runner at ... (OR from ... to ...) o'clock
ISGT	Construction	Intruding grout material at ... (OR from ... to ...) o'clock
ISSR	Construction	Intruding sealing material at ... (OR from ... to ...) o'clock
ISZ	Construction	Intruding sealing material (other) at ... (OR from ... to...)

IW	Service	Infiltration weeper at ... (OR from ... to ...) o'clock
JA	Structural	Joint Angular
JAM	Structural	Joint Angular, medium
JAL	Structural	Joint Angular, large
JL	Miscellaneous	Joint length changes at ... (OR from ... to...) o'clock
JO	Structural	Joint offset (displaced)
JOS	Structural	Joint offset (displaced), small/slight(< "t")
JOM	Structural	Joint offset (displaced), medium ("t" to 1.5 "t")
JOL	Structural	Joint offset (displaced), large (>1.5 "t")
JS	Structural	Joint separated (open)
JSS	Structural	Joint separated (open), small (< "t")
JSM	Structural	Joint separated (open), medium ("t" to 1.5 "t")
JSL	Structural	Joint separated (open), large (> 1.5 "t")
LC	Miscellaneous	Conduit lining changes (starts) at this point
LD	Construction	Line of conduit deviates down
LFAC	Structural	Lining, abandoned connection at ... to ... o'clock
LFB	Structural	Lining/coating blistered at ... (OR from... to...) o'clock
LFBK	Structural	Lining/coating buckled at ... (OR from... to...) o'clock
LFCS	Structural	Lining, service cut shifted at ... o'clock
LFD	Structural	Lining/coating detached at ... (OR from ... to ...) o'clock
LFE	Structural	Lining, defective end at (OR from ... to ...) o'clock
LFOC	Structural	Lining, overcut service at ... (OR from ... to ...) o'clock
LFR	Structural	Lining/coating wrinkled at ... (OR from ... to ...) o'clock
LFUC	Structural	Lining, undercut service at ... (OR from ... to ...) o'clock
LFZ	Structural	Lining/Coating failure, other at ... (OR from ... to ...) o'clock
LL	Construction	Line of conduit deviates left
LLD	Construction	Line of conduit deviates left then down
LLU	Construction	Line of conduit deviates left then up
LR	Construction	Line of conduit deviates right
LRD	Construction	Line of conduit deviates right then down
LRU	Construction	Line of conduit deviates right then up
LU	Construction	Line of conduit deviates up
MB	Structural	Missing bricks at ... (OR from ... to ...) o'clock
MC	Miscellaneous	Conduit material changes at this point
MM	Structural	Mortar missing at ... (OR from ... to ...) o'clock, may include Slight (S), Medium (M), or Large (L)
NBR	Construction	Node, branch at ... o'clock
NCOM	Construction	Node, mainline clean out, at ... o'clock
NCOP	Construction	Node, property clean out, at ... o'clock
NDP	Construction	Node, discharge point, at ... o'clock
NJB	Construction	Node, junction box
NM	Construction	Node, meter
NMH	Construction	Node, manhole
NOC	Construction	Node, other special chamber
NWA	Construction	Node, wastewater access
NWW	Construction	Node, wet well
OBB	Service	Obstruction, brick/masonry at ... o'clock and/or % cross-sectional loss
OBC	Service	Obstruction, through connection, at ... o'clock and/or % cross-sectional loss
OBI	Service	Obstruction, protruding through wall, at ... o'clock and/or % cross-sectional loss

OBJ	Service	Obstruction, wedged in joint, at ... o'clock and or % cross-sectional loss
OBM	Service	Obstruction, pipe material in invert, % cross-sectional loss
OBN	Service	Obstruction, construction debris, % cross-sectional loss
OBP	Service	Obstruction, external pipe/cable through sewer, % cross-sectional loss
OBR	Service	Obstruction, rocks, % cross-sectional loss
OBS	Service	Obstruction, built into structure, % cross-sectional loss
OBZ	Service	Obstruction, other, % cross-sectional loss
RB	Service	Ball of roots, ... % cross-sectional area loss from ... to ... o'clock
RBB	Service	Ball of roots, barrel, ... % cross-sectional area loss from ... to ... o'clock
RBL	Service	Ball of roots, lateral - inside service, ... % cross-sectional area loss
RBC	Service	Ball of roots, Connection - outside service, ... % cross-sectional area loss
RF	Service	Fine roots
RFB	Service	Fine roots, barrel
RFL	Service	Fine roots, lateral - inside service
RFC	Service	Fine roots, connection - outside service
RM	Service	Medium roots, ... %cross-sectional area loss from ... to ... o'clock
RMB	Service	Medium roots, barrel, ... %cross-sectional area loss from ... to ... o'clock
RML	Service	Medium roots, lateral - inside service, ... %cross-sectional area loss from ... to ... o'clock
RMC	Service	Medium roots, connection - outside service, ... %cross-sectional area loss from ... to ... o'clock
RPL	Structural	Point repair, localized liner, at ... (OR from ... ft to ... ft)
RPP	Structural	Point repair, patch repair, at ... (OR from... to...) o'clock
RPR	Structural	Point repair, pipe replaced, at ... (OR from ... to ...) ft
RPZ	Structural	Point repair, other (including joint seal), at ... (OR from... to...) ft or o'clock
RT	Service	Tap roots, ... % cross-sectional area loss from ... to ... o'clock
RTB	Service	Tap roots, barrel, ... % cross-sectional area loss from ... to ... o'clock
RTL	Service	Tap roots, lateral - inside service, ... % cross-sectional area loss from ... to ... o'clock
RTC	Service	Tap roots, connection - outside service, ... % cross-sectional area loss from ... to ... o'clock
SA	Miscellaneous	Survey abandoned
SAP	Structural	Surface damage, aggregate projecting at ... (OR from ... to ...) o'clock
SAV	Structural	Surface damage, aggregate visible at ... (OR from ... to ...) o'clock
SC	Miscellaneous	Conduit shape changes at this point
SCP	Structural	Surface corrosion, metal pipe, at ... (OR from ... to ...) o'clock
SMW	Structural	Missing Wall at ... (OR from ... to ...) o'clock
SRC	Structural	Surface damage, Reinforcement corroded at ... (OR from ... to ...) o'clock
SRI	Structural	Surface damage, Roughness increased at ... (OR from ... to ...) o'clock
SRP	Structural	Surface damage, Reinforcement projecting at ... (OR from ... to ...) o'clock
SRV	Structural	Surface damage, Reinforcement visible at ... (OR from ... to ...) o'clock
SSS	Structural	Surface damage, Surface spalling at ... (OR from ... to ...) o'clock
ST	Miscellaneous	Start of conduit survey length
SZC	Structural	Surface damage, chemical at ... (OR from ... to ...) o'clock
SZM	Structural	Surface damage, mechanical at ... (OR from ... to ...) o'clock
SZZ	Structural	Surface damage, not evident at ... (OR from ... to ...) o'clock
TB	Construction	Tap, Break-In/Hammer at ... o'clock
TBC	Construction	Tap, Break-In/Hammer, capped at ... o'clock
TBI	Construction	Tap, Break-In/Hammer, Intruding at ... o'clock, ... % cross-sectional area loss
TF	Construction	Tap, factory made junction at ... o'clock
TFC	Construction	Tap, factory made junction, capped at ... o'clock
TS	Construction	Tap, saddle at ... o'clock

TSC	Construction	Tap, saddle, capped at ... o'clock
VC	Service	Vermin, cockroach
VR	Service	Vermin, rat
VZ	Service	Vermin, other
WFC	Structural	Circumferential weld failure (at joint) from ... o'clock to ... o'clock
WFL	Structural	Longitudinal weld failure (at joint) at ... o'clock
WFS	Structural	Spiral weld failure (at joint) from ... to ... o'clock
WL	Miscellaneous	Water level, ... % height/diameter
WM	Miscellaneous	Water mark, ... % height/diameter
XB	Structural	Brick pipe collapsed, ...% of cross-sectional area loss
XM	Structural	Manhole collapsed, ... % of cross-sectional area loss
XP	Structural	Pipe collapsed, ... % of cross-sectional area loss
YN	Miscellaneous	Dye test not visible, ... color
YV	Miscellaneous	Dye test visible, ... color

For the last five years the City DWM of Atlanta has used WRc codes for describing defects. NASSCO (National Association of Sanitary Sewer Contractors) has modified WRc codes, in conjunction with WRc, to reflect sewer inspection nomenclature currently used throughout North America.

Copyright 2001, by NASSCO, Inc. "All rights reserved. This material is protected by Federal copyright law, which provides for severe penalties for violation. Copying this material without the express prior written permission of NASSCO and in violation of the Federal copyright law is strictly prohibited and will be prosecuted by NASSCO to the fullest extent allowable under applicable law."

DEFECT CODES SORTED ALPHABETICALLY BY TYPE

Code	Type	Definition
ISGT	Construction	Intruding grout material at ... (OR from ... to ...) o'clock
ISSR	Construction	Intruding sealing material at ... (OR from ... to ...) o'clock
ISZ	Construction	Intruding sealing material (other) at ... (OR from ... to...)
LD	Construction	Line of conduit deviates down
LL	Construction	Line of conduit deviates left
LLD	Construction	Line of conduit deviates left then down
LLU	Construction	Line of conduit deviates left then up
LR	Construction	Line of conduit deviates right
LRD	Construction	Line of conduit deviates right then down
LRU	Construction	Line of conduit deviates right then up
LU	Construction	Line of conduit deviates up
NBR	Construction	Node, branch at ... o'clock
NCOM	Construction	Node, mainline clean out, at ... o'clock
NCOP	Construction	Node, property clean out, at ... o'clock
NDP	Construction	Node, discharge point, at ... o'clock
NJB	Construction	Node, junction box
NM	Construction	Node, meter
NMH	Construction	Node, manhole
NOC	Construction	Node, other special chamber
NWA	Construction	Node, wastewater access
NWW	Construction	Node, wet well
TB	Construction	Tap, Break-In/Hammer at ... o'clock
TBC	Construction	Tap, Break-In/Hammer, capped at ... o'clock
TBI	Construction	Tap, Break-In/Hammer, Intruding at ... o'clock, ... % cross-sectional area loss
TF	Construction	Tap, factory made junction at ... o'clock
TFC	Construction	Tap, factory made junction, capped at ... o'clock
TS	Construction	Tap, saddle at ... o'clock
TSC	Construction	Tap, saddle, capped at ... o'clock
CI	Miscellaneous	Camera inverted, top of center line at ...o'clock
CU	Miscellaneous	Camera submerged
FH	Miscellaneous	Finish on conduit survey length
GO	Miscellaneous	General observation
GP	Miscellaneous	General photograph
JL	Miscellaneous	Joint length changes at ... (OR from ... to...) o'clock
LC	Miscellaneous	Conduit lining changes (starts) at this point
MC	Miscellaneous	Conduit material changes at this point
SA	Miscellaneous	Survey abandoned
SC	Miscellaneous	Conduit shape changes at this point
ST	Miscellaneous	Start of conduit survey length
WL	Miscellaneous	Water level, ... % height/diameter
WM	Miscellaneous	Water mark, ... % height/diameter
YN	Miscellaneous	Dye test not visible, ... color
YV	Miscellaneous	Dye test visible, ... color

DAE	Service	Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAES	Service	Light Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAEM	Service	Medium Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAEL	Service	Heavy Encrustation, ...%cross-sectional area loss from ...to...o'clock
DAGS	Service	Debris (grease) ...% cross-sectional loss from ... to ... o'clock
DAR	Service	Debris (ragging) ...% cross-sectional loss from ... to ... o'clock
DAZ	Service	Debris (not silt/grease/ragging) ...%cross-sectional loss from... to ... o'clock
DC	Service	Deposits, hard/compacted% cross-sectional loss from ... to ... o'clock
DF	Service	Deposits, fine% cross-sectional loss from ... to ... o'clock
DGV	Service	Deposits, gravel% cross-sectional loss from ... to ... o'clock
DIF	Service	Ingressed deposit, (fine) ...%cross-sectional loss from ... too'clock
DIGV	Service	Ingressed deposit, (gravel) ...%cross-sectional loss from ... too'clock
DIP	Service	Ingressed deposit, (peat) ...%cross-sectional loss from ... too'clock
DIS	Service	Ingressed deposit, (sand) ...%cross-sectional loss from ... too'clock
DIZ	Service	Ingressed deposit, (other) ...%cross-sectional loss from ... too'clock
DS	Service	Deposits settled, ...% cross-sectional loss from ... to ... o'clock
DZ	Service	Deposits settled (other), ... % cross-sectional loss from ... to ... o'clock
ID	Service	Infiltration dripper at ... (OR from ... to ...) o'clock
IG	Service	Infiltration gusher at ... (OR from ... to ...) o'clock
IR	Service	Infiltration runner at ... (OR from ... to ...) o'clock
IW	Service	Infiltration weeper at ... (OR from ... to ...) o'clock
OBB	Service	Obstruction, brick/masonry at ... o'clock and/or % cross-sectional loss
OBC	Service	Obstruction, through connection, at ... o'clock and/or % cross-sectional loss
OBI	Service	Obstruction, protruding through wall, at ... o'clock and/or % cross-sectional loss
OBJ	Service	Obstruction, wedged in joint, at ... o'clock and or % cross-sectional loss
OBM	Service	Obstruction, pipe material in invert, % cross-sectional loss
OBN	Service	Obstruction, construction debris, % cross-sectional loss
OBP	Service	Obstruction, external pipe/cable through sewer, % cross-sectional loss
OBR	Service	Obstruction, rocks, % cross-sectional loss
OBS	Service	Obstruction, built into structure, % cross-sectional loss
OBZ	Service	Obstruction, other, % cross-sectional loss
RB	Service	Ball of roots, ... % cross-sectional area loss from ... to ... o'clock
RBB	Service	Ball of roots, barrel, ... % cross-sectional area loss from ... to ... o'clock
RBL	Service	Ball of roots, lateral - inside service, ... % cross-sectional area loss
RBC	Service	Ball of roots, Connection - outside service, ... % cross-sectional area loss
RF	Service	Fine roots
RFB	Service	Fine roots, barrel
RFL	Service	Fine roots, lateral - inside service
RFC	Service	Fine roots, connection - outside service
RM	Service	Medium roots, ... %cross-sectional area loss from ... to ... o'clock
RMB	Service	Medium roots, barrel, ... %cross-sectional area loss from ... to ... o'clock
RML	Service	Medium roots, lateral - inside service, ... %cross-sectional area loss from ... to ... o'clock
RMC	Service	Medium roots, connection - outside service, ... %cross-sectional area loss from ... to ... o'clock
RT	Service	Tap roots, ... % cross-sectional area loss from ... to ... o'clock
RTB	Service	Tap roots, barrel, ... % cross-sectional area loss from ... to ... o'clock
RTL	Service	Tap roots, lateral - inside service, ... % cross-sectional area loss from ... to ... o'clock
RTC	Service	Tap roots, connection - outside service, ... % cross-sectional area loss from ... to ... o'clock
VC	Service	Vermin, cockroach

VR	Service	Vermin, rat
VZ	Service	Vermin, other
B	Structural	Conduit broken at..(OR from ...to...) o'clock
BSV	Structural	Conduit broken with soil visible at .. (OR from ...to...) o'clock
BVV	Structural	Conduit broken with void visible at .. (OR from ...to...) o'clock
CC	Structural	Circumferential crack from ...to... o'clock
CL	Structural	Longitudinal crack at ...o'clock
CM	Structural	Multiple cracks from ...to ...o'clock
CS	Structural	Spiral crack from ...to...o'clock
DB	Structural	Brick displaced at ...to...o'clock
DH	Structural	Conduit deformed. ... % change of horizontal dimension
DI	Structural	Dropped brick invert, gap ... mm
DV	Structural	Conduit deformed, ... % change of vertical dimension
FC	Structural	Circumferential fracture from ... to ... o'clock
FL	Structural	Longitudinal fracture at ... o'clock
FM	Structural	Multiple fractures from ... to ... o'clock
FS	Structural	Spiral fracture from ... to ... o'clock
H	Structural	Hole in sewer at ... (OR from ... to ...) o'clock
HSV	Structural	Hole in sewer w/soil visible at ... (OR from ... to ...) o'clock
HVV	Structural	Hole in sewer w/void visible at ... (OR from ... to ...) o'clock
JA	Structural	Joint Angular
JAM	Structural	Joint Angular, medium
JAL	Structural	Joint Angular, large
JO	Structural	Joint offset (displaced)
JOS	Structural	Joint offset (displaced), small/slight(< "t")
JOM	Structural	Joint offset (displaced), medium ("t" to 1.5 "t")
JOL	Structural	Joint offset (displaced), large (>1.5 "t")
JS	Structural	Joint separated (open)
JSS	Structural	Joint separated (open), small (< "t")
JSM	Structural	Joint separated (open), medium ("t" to 1.5 "t")
JSL	Structural	Joint separated (open), large (> 1.5 "t")
LFAC	Structural	Lining, abandoned connection at ... to ... o'clock
LFB	Structural	Lining/coating blistered at ... (OR from... to...) o'clock
LFBK	Structural	Lining/coating buckled at ... (OR from... to...) o'clock
LFCS	Structural	Lining, service cut shifted at ... o'clock
LFD	Structural	Lining/coating detached at ... (OR from ... to ...) o'clock
LFE	Structural	Lining, defective end at (OR from ... to ...) o'clock
LFOC	Structural	Lining, overcut service at ... (OR from ... to ...) o'clock
LFR	Structural	Lining/coating wrinkled at ... (OR from ... to ...) o'clock
LFUC	Structural	Lining, undercut service at ... (OR from ... to ...) o'clock
LFZ	Structural	Lining/Coating failure, other at ... (OR from ... to ...) o'clock
MB	Structural	Missing bricks at ... (OR from ... to ...) o'clock
MM	Structural	Mortar missing at ... (OR from ... to ...) o'clock, may include Slight (S), Medium (M), or Large (L)
RPL	Structural	Point repair, localized liner, at ... (OR from ... ft to ... ft)
RPP	Structural	Point repair, patch repair, at ... (OR from... to...) o'clock
RPR	Structural	Point repair, pipe replaced, at ... (OR from ... to ...) ft
RPZ	Structural	Point repair, other (including joint seal), at ... (OR from... to...) ft or o'clock
SAP	Structural	Surface damage, aggregate projecting at ... (OR from ... to ...) o'clock

SAV	Structural	Surface damage, aggregate visible at ... (OR from ... to ...) o'clock
SCP	Structural	Surface corrosion, metal pipe, at ... (OR from ... to ...) o'clock
SMW	Structural	Missing Wall at ... (OR from ... to ...) o'clock
SRC	Structural	Surface damage, Reinforcement corroded at ... (OR from ... to ...) o'clock
SRI	Structural	Surface damage, Roughness increased at ... (OR from ... to ...) o'clock
SRP	Structural	Surface damage, Reinforcement projecting at ... (OR from ... to ...) o'clock
SRV	Structural	Surface damage, Reinforcement visible at ... (OR from ... to ...) o'clock
SSS	Structural	Surface damage, Surface spalling at ... (OR from ... to ...) o'clock
SZC	Structural	Surface damage, chemical at ... (OR from ... to ...) o'clock
SZM	Structural	Surface damage, mechanical at ... (OR from ... to ...) o'clock
SZZ	Structural	Surface damage, not evident at ... (OR from ... to ...) o'clock
WFC	Structural	Circumferential weld failure (at joint) from ... o'clock to ... o'clock
WFL	Structural	Longitudinal weld failure (at joint) at ... o'clock
WFS	Structural	Spiral weld failure (at joint) from ... to ... o'clock
XB	Structural	Brick pipe collapsed, ...% of cross-sectional area loss
XM	Structural	Manhole collapsed, ... % of cross-sectional area loss
XP	Structural	Pipe collapsed, ... % of cross-sectional area loss

For the last five years the City DWM of Atlanta has used WRc codes for describing defects. NASSCO (National Association of Sanitary Sewer Contractors) has modified WRc codes, in conjunction with WRc, to reflect sewer inspection nomenclature currently used throughout North America.

Copyright 2001, by NASSCO, Inc. "All rights reserved. This material is protected by Federal copyright law, which provides for severe penalties for violation. Copying this material without the express prior written permission of NASSCO and in violation of the Federal copyright law is strictly prohibited and will be prosecuted by NASSCO to the fullest extent allowable under applicable law."

Material Coding

CODE	DEFINITION
ABS	Acrylonitrile Butadiene Styrene
BR	Brick
CI	Cast Iron Pipe
CMP	Corrugated Metal Pipe
CO	Cast-In-Place Concrete Pipe
CPP	Cured-In-Place Liner
DI	Ductile Iron Pipe
FRP	Fiberglass Reinforced Pipe
NCP	Non-Reinforced Concrete Pipe
ORG	Orangeburg Pipe
PE	Polyethylene Pipe
PLP	PVC Lined Pipe (Fold/Reform)
PVC	PolyvinylChloride Pipe
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
ST	Steel
VC	Vitrified Clay Pipe
WOD	Wood
XXX	Other (state in Comments)
ZZZ	Not Known

Shape Coding

CODE	DEFINITION
A	Arched (with flat bottom)
B	Barrel (e.g. beer barrel shape)
C	Circular
E	Egg shaped
H	Horseshoe (i.e., inverted U)
O	Oval
R	Rectangular
S	Square
T	Trapezoidal
U	U-Shaped with flat top
X	Other (state in Comments)

Existing Lining Coding

CODE	DEFINITION
BL	Bitumen
CL	Cement
IS	Soft inversion type liner
PL	Plastic
RL	Resin
XXX	Other (state in Comments)
ZZZ	Not Known

ATTACHMENT C

GENERAL INSPECTION LOGGING REQUIREMENTS

General Inspection Logging Requirements

(To be read in conjunction with other related documentation, i.e., Manual of Sewer Condition Classification):

The first three lines of each set of survey details **must** have the codes ST, MH, and WL (WL is optional but is important to the City DWM of Atlanta as it directly relates to the sewer flow level at a certain time of day).

The Manhole Number must be entered in the Remarks column against the MH code (this is essential as a number of Data Interrogation packages stores the Header and Detail records separately which are “connected” by an Index. To ensure data integrity, a QC check can be run against the Detail information to confirm that the correct Details are against the relevant Header).

i.e.:

0D10230	0.0	ST	
0D1	0.0	MH	SJ34255521
0D1	0.0	WL	10

Each line of Detail (or as a minimum the first and last Detail lines) must have the video digit entered against each code, presented in the following way:

– The video digits must conform to the National elapsed time based standards (time into the tape) for Video Tape recorders:

- Always four digits (hmms, where s = units of 10 seconds).
- Always right justified and zero filled.
- The following elapsed time format **MUST** be adhered to, i.e.:
0230
0 = Number of hours (Zero hours).
23 = Number of minutes (23 minutes).
0 = Units of 10 seconds each (0 seconds).

Other examples:

0032 = 3 minutes and 20 seconds into the tape.
0244 = 24 minutes and 40 seconds into the tape.
1503 = 1 hour, 50 minutes and 30 seconds into the tape.
2451 = 2 hours, 45 minutes and 10 seconds into the tape.

The final detail line for each survey must end with a Termination code, either SA or FH.

i.e.

0D1 89.0 RMJ 30
0D1 89.0F1JDS
0D10410 89.0 SA DUE TO ROOTS MASS
----- or -----
0D1 33.0 D 10
0D1 34.9 MH SJ35513464
0D10670 34.9 FH

Each Survey Report MUST only contain one survey hence, in the case of Survey Abandonment or a buried or uncharted manhole being encountered, a new Header and Detail must be completed.

The above are essential for the Validation of the data to take place

DRAFT

CITY OF ATLANTA – INTERNAL CONDITION ASSESSMENT LOG

Surveyors name (1) and Certificate number (1a) System Owner (2) Survey
 Customer (3) Drainage Area (4) P/O No. (5)

Pipeline Segment Reference (6) Date (7) Time (8) Location (Street Name) (9)

Further Location details (10) Upstream Manhole Number (11)
 Rim to Invert (12) Grade to Invert (13) Rim to Grade (14)

Downstream Manhole Number (15) Rim to Invert (16) Grade to Invert (17) Rim to Grade (18)
 Use of Sewer (19) Direction (20) Flow Control (21) Height (22)

Width (23) Shape (24) Material (25) Lining (26) Method (27) Pipe Joint Length (28) Total Length (29) Year Laid (30) Year Rehabilitated (31) Tape / Media Number (32) Purpose (33)

Sewer Category (34) Pre-Cleaning (35) Cleaned 35a) Weather (36) Location Code (37) Traffic Control 37a) Additional Information (38)

Distance (Feet)	Continuous Defect Code	CODE		Dimension 1	Dimension 2	Circumferential Location		Joint	Image Ref.	Video Ref.	F
		Group / Descriptor	Modifier/ severity			At/ From	To				

ATTACHMENT D

**SEWER.DAT DATA SPECIFICATION
AND
EXAMPLE OF SEWER.DAT DATA FILE**

Sewer.Dat Data Specification

To ensure that the data transfer file format is correct the following points are to be adhered to :

- The file is to be in a standard ASCII text format (i.e. no control characters) therefore each line in the file should be terminated by an ASCII carriage return/linefeed combination e.g. ASCII code 13 followed by ASCII code 10 (the default termination on most text generating programs).
- The maximum line length must not exceed 81 characters including the ASCII termination code, except for Line 1 where the Contractor can have their own reference after the 80th character.
- Decimal points must not be in any header field.
- Each Header line must start with a three character identifier “0Hn”, n being between 1 and 6.
- Each Detail line must start with a three character identifier “0D1”.
- Decimal points must be in Detail footage.
- N = Numeric

DATA TRANSFER SPECIFICATION

Line 1	“0H1	1	3	
	Inspected By	4	12	
	Contract No	16	8	
	Job Number	24	10	
	Catchment	34	10	
	Division	44	1	
	District	45	3	
	PLR	48	11	
Line 2	“0H2”	1	3	
	Date	4	6	
	Time	10	4	
	Road Name	14	30	
	Place Name	44	20	
Line 3	“0H3”	1	3	
	Start Manhole	4	10	
	Start Depth	14	4	(NNNN)
	Start Cover	18	5	(NNNNN)
	Start Invert	23	5	(NNNNN)
	Finish Manhole	28	10	
	Finish Depth	38	4	(NNNN)
	Finish Cover	42	5	(NNNNN)
	Finish Invert	47	5	(NNNNN)
Line 4	“0H4”	1	3	
	Use	4	1	

	Direction	5	1	
	Size 1	6	4	(NNNN)
	Size 2	10	4	(NNNN)
	Shape	14	1	
	Material	15	3	
	Lining	18	3	
	Pipe Length	21	3	
	Total Length	24	4	(NNNN)
	Year Laid	28	4	
Line 5	“0H5”	1	3	
	VT No.	4	5	
	Video Recorder	9	10	
	Comments	19	40	
Line 6	“0H6”	1	3	
	Purpose	4	1	
	Weather	5	1	
	Location	6	1	
	Location Details	7	50	
	Category Code	57	1	
	Pre-Cleanse	58	1	
Details	“0D1”	1	3	
	Video No.	4	4	(NNNN)
	Photo No.	8	3	(NNN)
	Distance	11	5	(NNN.N)
	CD	16	2	
	Code	18	4	
	Diameter	22	3	(NNN)
	Clock At	25	2	(NN)
	Clock To	27	2	(NN)
	*Percentage %	29	2	(NN)
	*Intrusion	29	4	(NNNN)
	Remarks	33	30	

***Note:** The position from character 29 to 32 is a shared field in that there is no defect or feature that would have both Percentage and Intrusion. Hence, if Percentage, the Start position would be 29 for two characters (99% max), and if Intrusion, the Start position would also be 29 but zero filled (20 inches would be 0020, for instance). If it is anticipated that there would be no intrusion greater than 99 inches (which is likely) then the Start position for Intrusion could be 31, as the resulting output file position would be the same but just without the two preceding zeros.

Example of Sewer.Dat Data File

Note: The 0 of 0H* and 0D1 is line character 1 and is a zero.

```
0H1ASI/DG      ASG0001 0          0          00002325021521X          6
0H20601001136HENDRIX AVENUE          LLOYD STREET BASIN
0H32325021521000000000000000232502153107070000000000
0H4FD0012      CVC - 0202986Z
0H500008          WRONG FINISH MH ON VIDEO.
0H6 1 -          0084  ZZ
0D10900  000.0  ST
0D10900  000.0  MH          23250215201 (BURIED)
0D10900  000.0  WL          05
0D10906  004.3  JN  00612
0D10920  009.6  B    1101  REPAIRED
0D10926  011.7  DE          10  RUBBLE
0D10933  013.3  B    1101
0D10943  017.8  CN  01201
0D10943  017.8  GO          SHAFT MADE TO ACCOMODATE CN
0D10960  024.0  JN  00602  CAPPED OFF
0D10976  034.9  B    1101  REPAIRED
0D11010  037.0  JN  00602  SW
0D11030  052.6  JN  00610  SW
0D11050  074.1  B    1101  REPAIR
0D11050  074.1  RF
0D11056  079.0  JN  00602  SW
0D11076  096.3  CN  00411
0D11086  098.3  DC          0015X 15
0D11103  110.4  CLJ  10
0D11140  116.7  CNI 00610  0003
0D11203  143.3  CN  00402
0D11230  170.2  CNI 00610  0003LIVE FW
0D11233  174.7  CL    12
0D11243  180.4S1FL  12
0D11256  182.1  BJ    1201
0D11260  199.3  BJ    1101
0D11270  199.9  H     06
0D11280  206.7  JDL
0D11280  206.7  PC          0015X 4FT
0D11306  221.7  CN  00610
0D11306  221.7  V
0D11316  224.2  MC          V.C.
0D11316  224.2  PC          0015X 2FT
0D11326  238.4  BJ    1112
0D11356  266.9  BJ    1112
0D11366  279.3  JDM
0D11373  281.3  DE          10  RUBBLE
0D11383  283.6  JDL
0D11390  284.5  B    1203
0D11390  284.5S4D  10
0D11400  294.0C4D  05
0D11406  298.6F4D  05
0D11406  298.6  MH          23250215301
0D11406  298.6  FH
ZZZ
```

+++ END OF SECTION 02655 +++

SECTION 02665
WATER MAINS AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

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

1.02 QUALITY ASSURANCE

- A. Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ANSI/AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
 - 2. ANSI/AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings
 - 3. ANSI/AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - 4. ANSI/AWWA C115/A21.15 – Flanged Ductile-Iron Pipe with Ductile- Iron or Gray-Iron Threaded Flanges
 - 5. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe
 - 6. ANSI/AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast
 - 7. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings for Water Service

8. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
9. ANSI /AWS D11.2 – Guide for Welding Iron Castings
10. AWWA C651 – Disinfecting Water Mains

1.03 SUBMITTALS

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

1.04 TRANSPORTATION AND HANDLING

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

1.05 STORAGE AND PROTECTION

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

1.06 WATER MAIN LOCATION

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

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

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

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 18	350
20	300

Pipe Sizes (inches)	Pressure Class (psi)
24	250
30 - 64	200

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

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

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

3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet.
4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

E. Gaskets: Gaskets for the various types of joints shall be as follows:

1. Gaskets for mechanical joints shall be made of vulcanized styrene butadiene (SBR) as specified in ANSI/AWWA C111/A21.11 unless specified otherwise. Reclaimed or natural rubber shall not be used. Gaskets shall be free from porous areas, foreign material and other defects that make them unfit for the use intended.
2. Gaskets for flanged joints shall be made of synthetic rubber, ring type or full face type and shall be 1/8-inch thick. Gaskets shall conform to the dimensions specified in ANSI/AWWA C111/A21.11.
3. Gaskets for push-on and restrained joints shall be in accordance with the pipe manufacturer's design dimensions and tolerances. Gaskets shall be made of vulcanized styrene butadiene (SBR) as specified in ANSI/AWWA C111/A21.11 unless specified otherwise.

F. Bolts and Nuts

1. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit.
2. Bolts and nuts for mechanical joints shall be tee head bolts and nuts of high-strength low-alloy steel having a minimum yield strength of 45,000 psi. Dimensions of bolts and nuts shall be in accordance with the dimensions shown in ANSI/AWWA C111/ A21.11.
3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A563. Zinc plating shall conform to ASTM B633, Type II.
5. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A194, Grade 8.

G. Mechanical joint glands shall be ductile iron.

- H. **Welded Outlets:** Welded outlets may be provided in lieu of tees or saddles on mains with a diameter greater than or equal to 24-inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 (Pressure Class 350 for 60 and 64-inch sizes). The welded outlet shall be rated for 250 psi working pressure. Each welded outlet shall be hydrostatically tested at 500 psi. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in the table below:

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

- I. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end from either direction on that pipe size. The thrust collars shall be continuously welded to the pipe by the pipe manufacturer.
- J. Solid sleeves shall be used to connect plain end ductile iron pipe. Solid sleeves shall meet the requirements of ANSI/AWWA C110/A21.10 for long pattern and have a minimum pressure rating of 250 psi. Solid sleeves shall have mechanical or restrained joints. Solid sleeves shall be manufactured by American Cast Iron Pipe Company, U. S. Pipe, or equal.
- K. Pipe stubs for all structure connections shall not exceed 2-feet in length. Caps shall be furnished where required.
- M. **Cement Lining**
1. Interior surfaces of all ductile iron pipe and fittings shall be cleaned and lined with a cement mortar lining applied in conformity with ANSI/AWWA C104/A21.4. If lining is damaged or found faulty upon delivery, the damaged pipe sections shall be repaired or removed from the site.
 2. The minimum lining thickness shall be as shown in the following table.

Lining shall be square and uniform with regard to the longitudinal axis of the pipe.

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

- N. Pipe Coating: Unless otherwise specified, pipe and fittings shall be coated with a 1 mil asphaltic coating as specified in ANSI/AWWA C151/A21.51.
- O. Polyethylene Encasement: Ductile iron pipe shall be encased with polyethylene film. Polyethylene film shall be as specified in Section 02616.
- P. Pipe Insulation: Where a water main is exposed to the elements because the pipe is above ground, insulate the pipe in accordance with industry and City DWM standards. Where insulation is to be furnished and installed it shall conform to the following:
 - 1. Insulating material shall be 3-inch thick polyurethane pipe covering formed to fit the pipe diameter.
 - 2. Outer covering shall be 0.016-inch thick aluminum chiller jacket with moisture shield and secured with stainless steel wire or stainless steel straps.
- Q. Acceptance will be on the basis of the Contractor's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

2.02 PIPING APPURTENANCES

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

2. Material

- a. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
- b. Ductile iron gripping wedges shall be contoured to fit on the pipe and shall be heat treated within a range of 370 to 470 BHN.
- c. Dimensions of the glands shall be such that they can be used with the standard mechanical joint bell and tee head bolts conforming to the requirements of ANSI/AWWA C111/A21.11 and ANSI/AWWA C 153/A21.53, latest editions.

3. Approvals

- a. Restraint devices shall be listed by Underwriters Laboratories (3-inch through 24-inch size) and approved by Factory Mutual (3-inch through 12-inch size).
- b. Mechanical joint restraint shall be Megalug Series 1100 as manufactured by EBAA Iron Inc., Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, or equal.

B. Hydrant Connections

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

- Connector pipe shall have an anchoring feature at both ends so that when used with mechanical joint split glands a restrained joint is provided.
- b. Hydrant connector pipe shall be cement lined in accordance with ANSI/AWWA C104/ A21.4 and have a bituminous coating in accordance with ANSI/AWWA C151/A21.51.
 - c. Hydrant connector pipe shall be equal to the Gradelok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.
 - d. Hydrant connector pipe shall not be used.
- C. Tapping Saddles: Tapping saddles are not allowed.
- D. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2-inches when buried less than 10-inches below the surface. Tape width shall be a minimum of 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

PART 3 EXECUTION

3.01 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. Lay all pipe and fittings to accurately conform to the lines and grades required.
- B. Pipe Installation
 1. Proper equipment, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
 2. All pipe, fittings, valves, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Contractor, who may prescribe corrective repairs or reject the materials.
 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.

4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with backfill material.
6. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
8. Provide detection tape for all pipe greater than 12-inches in diameter. Detection tape shall be buried 4 to 10-inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finish grade surface.

C. Alignment and Gradient

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

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

E. Joint Assembly

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

4. The Contractor shall internally inspect each pipe joint to insure proper assembly for pipe 24-inches in diameter and larger after the pipe has been brought to final alignment.
- F. Cutting Pipe: The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut. Cement lining shall be undamaged.
- G. Polyethylene Encasement: Installation shall be in accordance with ANSI/AWWA C105/A21.5 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired in accordance with industry standards.

3.02 CONNECTIONS TO WATER MAINS

- A. Make connections to existing pipe lines with tapping sleeves and valves.
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary to confirm the nature of the connection to be made.
- C. Interruption of Services: Make connections to existing water mains only when system operations permit and only when notices are issued to the customer. The Contractor will operate existing valves only with the specific authorization and direct supervision of the City DWM.
- D. Tapping Sleeves
 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
 2. Prior to attaching sleeve, the pipe shall be thoroughly cleaned utilizing a brush and rag as required.
 3. Before performing field machine cut, the watertightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five minutes.
 4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one percent hypochlorite solution.

- E. Connections using Solid Sleeves: Where connections are made using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the pipe line including cutting, excavation and backfill.
- F. Connections Using Couplings: Where connections are made using couplings, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, excavation and backfill.

3.03 THRUST RESTRAINT

- A. Provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: Provide retainer glands where required. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- C. Harnessing
 - 1. Harness rods shall be manufactured in accordance with ASTM A36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
 - 2. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90 degree bend eye bolts.
 - 3. Eye bolts shall be of the same diameter as specified in ANSI/AWWA C111/A21.11 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.
- D. Thrust Collars: Collars shall be constructed in accordance with industry and City DWM standards.
- E. Concrete Blocking
 - 1. When internal restraint cannot be provided, use concrete blocking for all bends, tees, valves, and other points where thrust may develop.
 - 2. Concrete shall be as specified in Section 03300.
 - 3. Form and pour concrete blocking at fittings where internal restraint cannot be achieved. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

3.04 INSPECTION AND TESTING

- A. All sections of the water main shall be hydrostatically pressure tested in accordance with AWWA C600 and these Specifications. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
- B. Water used for flushing and testing mains and other construction purposes will be made available to the Contractor as specified in **Section 01040**.
- C. Each segment of water main between main valves shall be tested individually.
- D. Test Preparation
 - 1. For water mains less than 24-inches in diameter, flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For water mains 24-inches in diameter and larger, the main shall be carefully swept clean, and mopped. Partially open valves to allow the water to flush the valve seat.
 - 2. Partially operate valves and hydrants to clean out seats.
 - 3. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.
 - 4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation stops at high points to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed with a meter box where required.
 - 5. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure.
 - 6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
 - 7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
- E. Test Pressure: Test the pipeline at 250 psi measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gauge with graduation not greater than 5 psi.
- F. Testing Allowance

1. Testing allowance shall be defined as the sum of the maximum quantity of makeup water that must be added into the pipeline undergoing hydrostatic pressure testing, or any valved section, in order to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 2. The City DWM assumes no responsibility for leakage occurring through existing valves.
- G. Test Results: No installed pipe shall be accepted if the quantity of makeup water exceeds the limits determined by the following formula:

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

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

As determined under Section 5 of ANSI/AWWA C600.

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

+++ END OF SECTION 02665 +++

SECTION 02666
TEMPORARY WATER MAINS AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

- A. In order to maintain uninterrupted water service to City customers during construction, the Contractor shall provide temporary above ground water systems. The temporary water systems shall consist of mains, fittings, valves, fire department outlets, and services.
- B. Connections to an existing water source shall be approved by the City DWM.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents. In addition, the following specific information shall be provided to the City DWM as part of the Project record:
 - 1. Complete product data and engineering data, including shop drawings.
 - 2. Evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two (2) years.
 - 3. Written certification that all products furnished comply with all applicable requirements of these Specifications.
 - 4. Detailed drawings and descriptions of all temporary water main piping and appurtenances showing all dimensions, parts, construction details, catalog cuts, descriptive literature, and materials of construction.
 - 5. Detailed drawings showing proposed layout and sequencing of temporary water main piping installation and removal, service connection details and proposed water source.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ASTM D1784 – Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.

2. ASTM D2241 – Standard Specification for Polyvinyl Chloride (PVC) Pressure Rated Pipe (SDR Series).
3. ASTM D2444 – Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).
4. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
5. ASTM F477 – Standard Specification for Elastomeric Seal for Joining PVC Pipe.
6. NSF/ANSI Standard 14 – Plastics Piping System Components and Related Materials.
7. NSF/ANSI Standard 61 – Drinking Water System Components – Health Effects

PART 2 PRODUCTS

- A. All temporary water main pipe and fittings shall be listed under NSF/ANSI 61 for potable water service and designated as NSF-PW.
- B. Pipe, fittings and couplings shall be color coded bright yellow to signify above-ground temporary potable water line.
- C. Fittings and couplings shall be manufactured by the pipe manufacturer and shall have spline-grooved ends.
- D. Fittings and couplings shall provide a restrained joint by means of a nylon spline inserted into the space created when the groove on the pipe and the interior groove in the coupling are aligned. A flexible elastomeric O-ring shall provide a hydraulic pressure seal.
- E. Isolation Valves:
 1. Isolation valves shall be 2-inch brass female curb stops for 2-inch mains and 4-inch resilient wedge valves for 4-inch mains (grip rings shall be used for 4-inch valves).
 2. Valves shall be located every 500 feet.
 3. The valves shall be attached to the mains using pre-fabricated adapters.

- F. Temporary service lines shall be hose or tubing, 5/8-inch diameter (minimum) rated for 250 psi.
- G. Temporary water main pipe and fittings shall be Certa-Lok Yelomine Restrained Joint PVC Pressure Piping System as manufactured by CertainTeed or Aquamine Pipe as manufactured by Victaulic Company. Pressure class shall be 250 psi.

PART 3 EXECUTION

3.01 CONNECTIONS TO EXISTING WATER MAINS

- A. The Contractor shall make connections to existing water mains at fire hydrants including an approved backflow device. The Contractor shall supply all piping, appurtenances, and approved backflow device for connection to the fire hydrant. The Contractor shall obtain the meter from the City DWM. Refer to **Section 01040** for water usage requirements.
- B. The Contractor shall notify customers affected within the area of work, two weeks prior to initiating their forces, and 48 hours prior to commencing work in the affected area. After notification has been given in the affected areas, the existing water mains to be lined shall be isolated by the City DWM. In addition, the Contractor will locate all meter boxes and document the condition of meter boxes, meters and curb stops. Refer to **Section 01351**.
- C. The Contractor shall operate existing valves only with the specific authorization and direct supervision of the City DWM.

3.02 INSTALLATION

- A. Temporary above ground water mains shall be installed in a manner to both protect the public water supply and to minimize customer service interruption.
- B. Temporary mains shall typically be installed behind sidewalks or along the edge of sidewalks and within the public right of way. The mains shall follow a uniform straight course and shall not bow to accommodate long sections of pipe.
- C. Temporary mains shall not be installed on private property.
- D. The Contractor shall follow the pipe manufacturer's installation guidelines when installing temporary systems. Additionally, an approved joint lubrication for the installation of potable water pipe shall be used on all joints prior to connecting pipe.
- E. Driveway Crossings: A cold patch raised berm shall be placed over temporary mains to prevent vehicles from dragging along the ridge.

- F. Sidewalk Crossings: A cold patch raised berm shall be placed over temporary mains to eliminate tripping hazards. In areas where the berm will prevent rainwater drainage plywood ramps shall be installed the full width of the sidewalk and over the temporary mains.
- G. Roadway Crossings: Temporary mains shall be buried just below the surface of the roadway. The pipe shall be protected with clean sand or material free from rocks, as the rocks may punch through the pipe when exposed to heavy traffic. The use of cold patch as fill material is acceptable.
- H. Curb Rise: To accommodate curb rise, pre-fabricated bends and/or elbows shall be used. Sweeping or bending the pipe shall not be allowed unless the sweep lies flat on the ground and does not obstruct walkways. A traffic barrel shall be placed near the curb at offset connections to protect the offsets from being damaged by vehicles.
- I. Cutting Pipe: The Contractor shall follow manufacturer's instructions when cutting pipe. All joints, including those on cut lengths of pipe, shall be grooved to provide a restrained joint. Pre-fabricated bends, elbows, and tees shall be used when changing direction.
- J. Blow Off: A 1-inch blow off shall be installed at the ends of all temporary mains. The blow off shall be constructed using a 1-inch brass female curb stop.
- K. Service Connections:
 - 1. Temporary service connections shall be hose or tubing as specified herein. The temporary service connection shall be extended from the temporary water main to the existing meter and connected to the meter with appropriate restrained adapters and valves.
 - 2. Before connecting to the existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to re-connect the existing meter to the temporary service connection shall be provided by the Contractor. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.
 - 3. Special connections requiring excavation, cutting or tapping shall be made by the Contractor.

4. When the water main has been lined, the Contractor shall clean the existing service line by back-flushing with air or water. After the water main is returned to service, the Contractor shall restore the customer's water service and disconnect the temporary connection.
- L. The pipe and fittings shall be watertight. Care shall be exercised throughout the installation of any temporary pipe and service fittings to avoid the possible contamination of any existing water main, water services or the temporary service pipe. Flushing of the service connections and chlorination of by-pass piping prior to their use will be required. Temporary service connections shall be valved at the point of connection to the temporary water main piping and also at the existing meter so that, except for the final connection, the temporary water main line and service can be chlorinated.
- L. Temporary water main piping and service connections shall not be installed during freezing or inclement weather and pipes already in use shall be removed or drained and services restored when temporary service is no longer necessary. Removal and re-installation of such pipes or services shall be done at the Contractor's expense.
- M. It shall be the responsibility of the Contractor to ensure an adequate water supply at all times. The Contractor shall be responsible for restoring a customer's water supply within two hours of completion of Work requiring the service disruption.
- N. The Contractor shall not tamper with any electrical ground wires found connected to the service pipes before the meter. In cases where the ground wires interfere with the Contractor's proposed work, the Contractor shall, at no cost to the City DWM, have the wire disconnected and reconnected by qualified personnel in accordance with all electrical regulations in force. Contractor shall utilize a jumper wire to ensure that grounding continuity is not compromised.

3.03 SERVICE RE-CONNECTION AT METER

- A. Service re-connection at the meter shall consist of the following:
 1. Removal of temporary service from existing meter.
 2. Reconnection of existing service to existing meter.
 3. Re-inspection of the existing meter.
 4. Documentation verifying disconnection and reconnection (Location, Dates, Times, etc.)
- B. After the re-connection is complete, the Contractor shall open all valves and check for leaks. Leaks that are detected shall be corrected immediately. Water shall be run through the meter to make sure that the meter register functions properly and to test the meter for leakage.

- C. The Contractor shall notify the customer that they may experience temporary air trap at any of their fixtures and that it can be relieved by running the water.
- D. The Contractor will be responsible for any additional costs/damages resulting from incorrect re-connection of the existing service line including but not limited to the cost of the meter.
- E. The Contractor shall be responsible, at their expense, for any damage done to the customer's service plumbing as a result of the meter being disconnected or re-installed. This requirement shall not apply to leaks, or other pre-existing conditions, noted by the Contractor and acknowledged in writing by the customer, as being in existence prior to the Work of this contract being initiated.

3.04 INSPECTION AND TESTING

- A. All sections of the water main subject to internal pressure shall be pressure tested in accordance with the requirements of ANSI/AWWA C600 and these Specifications.
- B. Water used for testing mains shall be made available to the Contractor at the nearest existing facilities of the Department of Watershed Management. The Contractor shall furnish all necessary pipe or hose extensions and transportation to the point of use and exercise care in use of the water. Water used for other purposes will be supplied through a metered connection, which the Contractor shall obtain from the City DWM.
- C. Each segment of water main between main valves shall be tested individually.
- D. Leakage Test: All systems shall be watertight. A static pressure test shall be performed on all systems prior to disinfecting any portion of the system.
 - 1. Install a pressure gauge at furthest end of the system. The Contractor shall provide an accurate liquid filled pressure gage with graduation not greater than five (5) psi.
 - 2. Open main feed valve to fully charge the system with water and bleed all air.
 - 3. Record the static pressure reading.
 - 4. Close the main feed valve.
 - 5. The system shall hold static pressure of two-hundred and fifty (250) psi for a minimum of 30 minutes.

3.05 DISINFECTING PIPELINE

After successfully pressure testing each temporary water main section, the Contractor shall disinfect the temporary water main system in accordance with the requirements of Section 02675.

3.06 MAINTENANCE

- A. The Contractor shall be responsible for maintaining the temporary systems during the regular workday including making repairs to the systems. The Contractor shall respond to all after hour emergencies. All affected customers shall be notified as soon as possible prior to any service interruption.

- B. Contractors shall keep an inventory of readily available repair parts on hand enabling them to quickly respond to any type of problem associated with the temporary water systems. Restrained joints shall be maintained. The use of non-restrained joint couplings is prohibited. Joint leaks shall be cut out. The use of stainless steel wrap around repair clamps over pinholes is acceptable.

+++ END OF SECTION 02666 +++

SECTION 02668
WATER SERVICE CONNECTIONS

PART I GENERAL

1.01 SCOPE

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

1.02 SERVICE COMPATIBILITY

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

1.03 QUALITY ASSURANCE

Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards.

1. ANSI/AWWA C800 – Underground Service Line Valves and Fittings
2. ASTM B88 – Standard Specification for Seamless Copper Water Tube
3. NSF/ANSI Standard 61 – Drinking Water System Components – Health Effects

1.04 MATERIAL TO BE FURNISHED BY THE CITY DWM

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

PART 2 PRODUCTS

2.01 MATERIALS

- A. Meter Boxes for 1 1/2-inch and 2-inch service lines: Meter boxes for 1 1/2-inch and 2-inch service lines shall be constructed of concrete masonry units as specified in Section 04000, and concrete as specified in Section 03300 or precast concrete.
- B. Service Line
 1. Service line shall be copper tubing. Tubing shall be Type K, rolled type, conforming to ASTM B88.
 2. Fittings shall be cast copper alloy with compression type inlet and outlet connections.

3. Where required, adapters shall be brass.
- C. Valves and Accessories
1. Ball Valves
 - a. Ball valves shall be full port, heavy duty type and shall seal full rated pressure with flow in either direction.
 - b. Valve body shall be bronze conforming to ASTM B62, with threaded ends. End connections shall be compression type for type K copper tubing and shall be furnished with meter swivel nuts, with meter gasket, for 5/8-inch through 1-inch meter connections and flanged end for 1 ½-inch and 2-inch meter connections.
 - c. Valves shall have a maximum water pressure rating of 300 psi.
 - d. Valves shall have a maximum water temperature rating of 180 degrees F.
 - e. Valves shall be Mueller 300 ball valves or equal.
 2. Corporation Stops
 - a. Corporation stops shall be ball type and shall be made of bronze conforming to ASTM B62.
 - b. Corporation stops shall be suitable for a maximum water pressure rating of 300 psi.
 - c. Inlet shall be tapered thread conforming to AWWA C800.
 - d. Outlet connection shall be threaded for compression type connection for type K copper tubing
 - e. Corporation stop shall be model B-25008 as manufactured by Mueller Company or model 3128B as manufactured by A.Y. McDonald Manufacturing Co. or equal.
 3. Curb Stops
 - a. Curb stops shall be ball type and shall be made of bronze conforming to ASTM B62.
 - b. Curb stops shall be suitable for a maximum water pressure rating of 300 psi.
 - c. Inlet connection shall be threaded for compression type connection for type K copper tubing. Outlet shall be furnished with a threaded meter swivel nut, with meter gasket, or flanged to match size of meter.
 - d. Ball valve shall be brass and shall seat watertight with flow in either direction.
 - e. Curb stop shall be furnished with padlock ring for locking valve in closed position.
 - f. Curb stop shall be model B-25172 as manufactured by Mueller Company or model 6100W as manufactured by A.Y. McDonald Manufacturing Co. or equal.

4. Service Fittings and Couplings: Service fittings and couplings shall conform to the requirements of AWWA C800.

PART 3 EXECUTION

3.01 GENERAL

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

3.02 TAPPING WATER MAIN

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

3.03 METER BOXES

- A. Oval cast iron meter boxes with lids for installation with $\frac{3}{4}$ -inch and 1-inch meters shall be furnished by the City DWM as specified in Paragraph 1.04 of this Section.
- B. Rectangular cast iron meter box lids and frames for installation with 1 $\frac{1}{2}$ -inch and 2-inch meters shall be furnished by the City DWM as specified in paragraph 1.04 of this Section. Meter boxes for 1 $\frac{1}{2}$ -inch and 2-inch meters shall be furnished and installed by the Contractor.

- C. Meter boxes shall be installed by the Contractor in the same location as the original meter or, in the case of a new meter, at a location designated by the City DWM.
- D. Meter box installation shall include valves, fittings and accessories to allow for future installation of meter and backflow preventer by the City DWM.
- E. Meter boxes shall be located perpendicular to the curb. The street edge of the box shall be located 18-inches (maximum) behind the back of the curb and the meter lid shall be set at finished grade. The meter box shall be set on a bed of gravel. The gravel shall be 3-inches thick and extend 6-inches in all directions beyond the edge of the meter box.

3.04 SERVICE LINES

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

3.05 TRANSFER OF SERVICE

- A. All service lines to be replaced or transferred shall be the same size as existed prior to construction.
- B. New service lines shall be installed between the new main and the existing meter. If a new service line or the existing meter connection or fitting is damaged during construction, it shall be abandoned and a new copper service line and meter connection and fitting will be installed at the Contractor's expense.
- C. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation cock shall be opened and all visible leaks shall be repaired and approved by the Contractor.
- D. Immediately before connecting to the existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line shall be provided by the Contractor.
- E. The existing service lines shall be abandoned in place at the corporation stop.

3.06 RELOCATION OF EXISTING METERS AND METER BOXES

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

3.07 MAINTENANCE AND REPAIRS

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

+++ END OF SECTION 02668 +++

**SECTION 02671
BIORETENTION AREAS AND BIOSWALES**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Section includes construction of bioretention areas and bioswales that are designed to capture, temporarily store or convey (as applicable), and infiltrate or filter runoff to provide water quality treatment.

- B. Related Work Specified Elsewhere:
 - 1. Section 02125 – Temporary and Permanent Erosion and Sedimentation Control
 - 2. Section 02200 – Earthwork
 - 3. Section 02371 – Green Infrastructure Geotextiles
 - 4. Section 02681 – Subdrainage for Stormwater Quality Facilities
 - 5. Section 02682 – Pretreatment for Stormwater Quality Facilities
 - 6. Section 02900 – Trees, Plants and Ground Covers
 - 7. Section 02922 – Amended Soil and Mulch
 - 8. Section 02934 – Native Plug Planting
 - 9. Division 03 Specifications: For concrete construction

1.02 REFERENCES

Georgia Department of Transportation (GDOT):

“Standard Specifications, Construction of Transportation Systems”, Latest Edition (GDOT Standard Specifications).

1.03 SYSTEM DESCRIPTION

- A. Bioretention areas shall include:
 - 1. Pretreatment facilities.

2. Flow inlet structure.
 3. Drainage stone and underdrain piping system.
 4. Bioretention soils (engineered soil mix) planting bed.
 5. Vegetation.
 6. Outlets and overflow spillways.
- B. B. Bioswales shall include the following:
1. Pretreatment facilities.
 2. Open conveyance channel.
 3. Drainage stone and underdrain piping system (if required).
 4. Filter bed of bioretention soils (engineered soil mix).
 5. Vegetation.
 6. Check dams (with weirs as required)
 7. Outlets and overflow spillways.

1.04 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents.
- B. Submit the following to the City DWM as part of the Project record prior to shipment of materials to the Site:
1. Shop Drawings for system components, showing plans, sections and details to include the following:
 - a. Inlet and outlet structures (as applicable)
 2. Manufacturer's data (including product data sheets and test results) from manufacturers or suppliers for proposed materials showing compliance with the Specifications for the following materials:
 - a. Engineered soil mix.
 - b. Drainage stone and other granular materials.

- c. Underdrain piping and outlet piping
- C. Submit the following at completion of the Work:
 - 1. Field Quality Control: Submit test reports and inspection reports (as applicable).

1.05 QUALITY ASSURANCE

Comply with the requirements of governmental authorities having jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All manufactured products shall be inspected upon delivery to the Site. Damaged or defective materials shall be rejected or repaired as approved by the Contractor . All manufactured products that are damaged or defective and not rejected, the City DWM shall concur with repair as approved by Contractor.
- B. Conform to manufacturer's recommendations for handling and storage of products.
- C. Granular materials of different gradations shall be delivered to the Site using clean equipment, and separately stockpiled in areas approved by the Contractor representative. Adequately protect to preserve the materials' fitness and quality.

1.07 PROJECT CONDITIONS

- A. The Contractor is solely responsible for excavation slope stability. Excavation work shall be in compliance with applicable local, state and federal regulations (including OSHA).
- B. Work shall be performed in a manner that does not damage or disturb existing utilities, structures, vegetation, and other site features not indicated to be removed.

1.08 SEQUENCING AND SCHEDULING

Coordinate bioretention area and bioswale construction with associated work specified in other sections.

PART 2 PRODUCTS

2.01 PRETREATMENT AND FLOW-REGULATING DEVICES

- A. Pretreatment elements and flow-regulating (energy dissipation) devices shall be provided where possible to filter out sediment, trash, floatables and pollutants from runoff prior to entering bioretention areas and bioswales.
- B. Pretreatment and energy dissipation shall be as required and specified in Section 02682.

2.02 INLETS

- A. Inlets shall be provided to direct stormwater into bioretention areas as required, including one or more of the following:
 - 1. Curb cuts at edge of bioretention area
 - 2. Sheet flow off depressed curbs with a 3-inch drop
 - 3. Trench drains that convey flows across a sidewalk from curbs or downspouts
 - 4. Inlet structures
- B. Inlet structures (if required) shall be precast or cast-in-place concrete structures constructed to the required dimensions and conforming to the applicable requirements of Section 668 of the GDOT Standard Specifications.

2.03 CHECK DAMS

- A. Check dams for bioswales shall be constructed of concrete, stone, or other approved materials. Stone check dams shall conform to COA Standard Detail ER-G CD001.
- B. Concrete structures shall be cast-in-place or precast reinforced concrete constructed to the required dimensions. Unless otherwise specified, minimum compressive strength of concrete shall be 3000 psi.
- C. Concrete formwork, reinforcement, concrete materials and mix design, and accessories shall conform to the applicable requirements of Division 03 Specifications.

2.04 CHOKER COURSE AND DRAINAGE STONE

Choker course material and drainage stone shall conform to the material specifications in Section 02681.

2.05 GEOTEXTILE

Specified in Section 02371.

2.06 UNDERDRAIN PIPING

- A. Underdrain piping and associated cleanouts shall conform to the applicable material specifications in Section 02681.
- B. Furnish required fittings (including tees, elbows and caps) to provide a complete installation.

2.06 ENGINEERED SOIL MIX AND MULCH

Engineered soil mix and mulch layers shall conform to the specifications in Section 02922.

2.08 OUTFLOW REGULATING DEVICES

- A. Outflow regulating devices shall include non-perforated piping as required. Non-perforated piping shall conform to the material specifications in Section 02681.
- B. Outflow structures (if required) shall be precast or cast-in-place concrete structures constructed to the required dimensions and conforming to the applicable requirements of Section 668 of the GDOT Standard Specifications.

2.09 VEGETATION

Furnish , shrubs, and herbaceous vegetation as indicated on the Drawings and specified in Sections 02900 and 02934.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

Record surveying shall be performed by the Contractor's RLS to record elevations of excavations prior to placement of materials and finished surface of completed bioretention areas and bioswales.

3.02 PREPARATION

- A. Establish required dimensions and elevations for construction.
- B. Construction of bioretention areas and bioswales shall not commence until contributing drainage areas have been stabilized. If this is not feasible, divert stormwater flow around the areas. Excavate in dry conditions as much as practicable.
- C. Erosion and sediment control measures shall be implemented to protect construction areas. Conform to the applicable codes and ordinances and the requirements of Section 02125.

3.03 EARTHWORK

- A. Excavate for construction of bioretention areas and bioswales to the required dimensions, side slopes and elevations or as otherwise approved by the City DWM's representative. Conform to the applicable requirements of Section 02200 for excavation work. Compaction of subgrade soils shall not be performed and no heavy equipment will be allowed on the exposed bottom of excavation.
- B. Construct check dams in bioswales as required.
- C. To prevent compaction within the limits of bioretention areas and bioswales, only hand laborers, small excavation hoes with wide tracks, light equipment with turf tires, marsh equipment or wide-track loaders may be used. No heavy equipment shall be used within 10 feet of the perimeter of the bioretention or bioswale facility before, during, or after the placement of the soil mix.
- D. Excavated materials shall be removed from the construction areas and placed in other locations on the site, if needed, or off-site where approved by the Contractor.

3.04 INSTALLATION OF CONTROL PIPING AND STRUCTURES

- A. Coordinate aggregate placement with installation of piping and drop inlets.
- B. Install outlet piping at the alignment and elevations indicated. Conform to the applicable requirements of Sections 02681 for installation of piping.
- C. Install inlet and outlet control structures (as applicable) at the locations and elevations indicated. Conform to the applicable requirements of Section 668 of the GDOT Standard Specifications.

3.05 PLACEMENT OF DRAINAGE BED AND UNDERDRAIN PIPING

- A. Install geotextile (if required) where indicated and as specified in Section 02371.

- B. Place choker course material and drainage stone to the required depths and in the sequence indicated and as specified in Section 02681.
- C. Install underdrain pipe (if required) at the locations indicated and as specified in Section 02681.

3.06 PLACEMENT OF ENGINEERED SOIL MIX AND MULCH

- A. Prepare and place engineered soil mix and mulch to the depth and limits indicated and as specified in Section 02922.
- B. Installation of soils must be completed in a manner that will ensure preservation of the infiltrative capacity of the underlying soils. The moisture content of the soil mix shall be low enough to prevent clumping and compaction during placement.

3.07 VEGETATION PLANTING

- A. If placement of engineered soil mix coincides with preferred dates for planting, install plants immediately after completion of the soil mix. Otherwise, place mulch or other approved stabilization material and maintain until planting is completed.
- B. Plant, shrubs, and herbaceous vegetation as indicated on Drawings and specified in Sections 02900 and 02934 (as applicable).

3.08 MAINTENANCE AND PROTECTION

- A. Prior to the City DWM's final acceptance of the Work, Contractor shall perform maintenance and protection of the construction as specified in this Section. In addition, for the one year warranty period, Contractor shall correct or remove and replace defective work as approved by the City DWM's representative in accordance with the terms of the Contract.
- B. Remove all debris from within the limits of the constructed stormwater quality facilities.
- C. Protect the constructed areas from erosion and keep free from accumulation of debris. Divert post-construction stormwater runoff around the areas until vegetative cover has been established.
- D. Damage to the constructed areas shall be fully repaired as approved by the City DWM's representative.

+++ END OF SECTION 02671 +++

**SECTION 02675
DISINFECTION OF WATER MAINS**

PART 1 GENERAL

1.01 SCOPE

The work covered by this Section includes furnishing all labor, equipment, materials, chemicals and incidentals required to disinfect all water mains installed under this contract.

1.02 QUALITY ASSURANCE

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

1.03 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract Documents. In addition, the following specific information shall be provided:

1. Disinfection shall be performed by a specialty contractor routinely engaged in the disinfection of potable water facilities. Before disinfection is performed, the Contractor shall submit a written pipeline disinfection procedure for City DWM approval before being permitted to proceed with the disinfection. The plan shall also include the steps to be taken for the neutralization of the chlorinated water.
2. In addition, for mains 24-inches in diameter and larger, the Contractor shall submit the resume of a Disinfection Supervisor. The Disinfection Supervisor shall have demonstrated prior disinfection experience with at least 10 miles of 24-inch diameter or greater water transmission mains in the state of Georgia.

PART 2 PRODUCTS

2.01 DISINFECTION AGENT

The disinfection agent shall be free chlorine or chlorine compound.

PART 3 EXECUTION

3.01 DISINFECTION OF PIPELINE

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feed method and these Specifications.
- B. Chlorination:
 - 1. Contractor shall meet the disinfection requirements of the current version of the Georgia Environmental Protection Division, Drinking Water Permitting & Engineering Program, Minimum Standards for Public Water Systems, or the requirements below, whichever are more stringent.
 - 2. Contractor shall apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours. Water shall be supplied from a temporary source protected by appropriate backflow prevention devices. Backflow preventer must be approved by the City DWM prior to connection. Chlorine shall be injected no more than 10 feet from the beginning of the new main.
 - 3. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period.
 - 4. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.
 - 5. Final pipeline disinfection shall occur at the end of the construction period immediately prior to putting the main in service.
 - 6. Main disinfection shall be performed and evaluated in sequential and contiguous pipe sections between in-line valves.
- C. Disposal of Chlorinated Water: Reduce chlorine residual of disinfected water to less than 1 milligram per liter if discharged directly to a body of water or to less than 2 milligrams per liter if discharged onto ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize the chlorine residual. Flush all lines until residual is equal to existing system. Contractor shall be responsible for any state or local permits required for the disposal of flushing water.

- D. Bacteriological Testing: After final flushing and before the water main is placed in service, the City DWM shall collect samples from the main and deliver them to the City DWM's designated laboratory for bacteriological testing. One set of samples shall be collected from every 1,200 feet of water main, plus one set from each end of main. Testing shall be performed by the City DWM's water laboratory. If test results are not satisfactory, the Contractor shall re-chlorinate the mains until required results are obtained.

+++ END OF SECTION 02675 +++

SECTION 02676
ABANDONMENT OF EXISTING WATER MAINS

PART 1 GENERAL

1.01 SCOPE

The work covered under this section includes furnishing all labor, materials, and equipment required for abandonment of existing water mains and appurtenances.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract Documents. Prior to beginning work, a schedule of demolition and detailed methods to be used on each pipeline or appurtenance to be abandoned or demolished shall be submitted.

1.03 QUALITY ASSURANCE

Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.

1. ASTM C150 - Standard Specification for Portland Cement
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C1107 – Standard Specification for Packaged, Dry, Hydraulic Cement Grout (Nonshrink)
4. CRD C621 - Corps of Engineers Specification for Non-shrink Grout.

PART 2 PRODUCTS

2.01 GENERAL

- A. Crushed stone aggregate backfill, as specified in Section 02225 shall be used where applicable for work described in this Section.
- B. Concrete shall be 3000 psi as specified in Section 03300.
- C. Grout shall be as specified in Section 03600.

PART 3 EXECUTION

3.01 ABANDONING/KILLING EXISTING WATER MAINS AND VALVES

A. General

1. Abandon in place all existing water main segments and valves required to be abandoned or killed. Abandon existing water mains and valves after the new water main has been placed in service and all water main services have been transferred over to the new main.
2. The Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be abandoned and cut and plugged.

B. Cutting and Plugging Main

1. Disconnect existing main by sawing or cutting and removing a segment of existing pipe where required.
2. Provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service.
3. Seal ends of existing mains to be abandoned with a pipe cap or plug or a masonry plug and pour a minimum of 6-inches of concrete on all sides around the end of the pipe.

C. Valves

1. Pavement shall be saw cut and removed from around valve box. The direction of the pavement cuts shall be parallel and perpendicular to the direction of the traffic. Size of saw cut shall be 18-inches x 18-inches (maximum).
2. Remove all valve covers, valve boxes and extension stems from valves on mains to be abandoned/killed. Valves shall remain in place. Deliver all valve covers, valve boxes and extension stems to the City DWM's pipe yard.
3. Backfill excavations with suitable material and compact. Install 6-inch graded aggregate base and repave area as required.

3.02 REMOVAL OF EXISTING WATER MAINS

- A. The Contractor shall completely remove existing water mains to the required limits. Pipe removed shall be immediately removed from the Work site by the Contractor.
- B. The Contractor shall backfill the trench with earth backfill in accordance with City DWM standards. Backfill shall be compacted to a minimum of 95% of the maximum dry density, unless shown or specified otherwise.

- C. Where new pipe is to be installed in the same trench from which existing pipe was removed, the Contractor shall backfill the trench with crushed stone aggregate backfill if the bottom of the existing pipe is below bottom of the new pipe

3.03 ABANDONMENT OF EXISTING STRUCTURES

- A. The Contractor shall abandon existing structures as required. The Contractor shall remove the existing manhole frames and covers and deliver them to the City DWM's pipe yard. The existing structures shall be demolished to a minimum depth of 3-feet below existing or finished grade, whichever is lower.
- B. The Contractor shall backfill the remainder of the structures with earth backfill in accordance with City DWM standards. Backfill shall be compacted to a minimum of 95% of the maximum dry density, unless shown or specified otherwise.

3.04 REMOVAL AND BACKFILL OF EXISTING STRUCTURES

- A. The Contractor shall completely remove structures where required.
- B. The Contractor shall backfill the excavations with earth backfill in accordance with City DWM standards. Backfill shall be compacted to a minimum of 95% of the maximum dry density, unless shown or specified otherwise.

3.05 CLEANUP

- A. After the abandonment or removal work has been completed, the Contractor shall restore the project area to a condition equal to or better than existed prior to construction Site restoration shall be performed in accordance with the requirements of Section 02920, Site Restoration.
- B. Disturbed grassed areas shall be restored as specified in Section 02933, Seeding and Sodding.

+++ END OF SECTION 02676 +++

SECTION 02681
SUBDRAINAGE FOR STORMWATER QUALITY FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

Section includes construction of subdrainage (underdrain) systems to collect and discharge filtered stormwater runoff in stormwater quality facilities, including installation of piping, drainage stone and other granular materials.

1.02 REFERENCES

A. ASTM International:

1. ASTM D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction
2. ASTM D1785, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
3. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
4. ASTM D 2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
5. ASTM D 3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
6. ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
7. ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
8. ASTM F 810, Standard Specification for Smooth Wall Polyethylene (PE) Pipe for Use in Drainage and Waste Disposal Absorption Fields

B. Georgia Department of Transportation (GDOT):

1. "Standard Specifications, Construction of Transportation Systems", Latest Edition (GDOT Standard Specifications)

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents.
- B. Submit the following to City DWM as part of the Project record prior to shipment of materials to the Site:
 - 1. Manufacturers' documentation indicating conformance with the specifications for underdrain pipe or specified subsurface drainage system components.
 - 2. Certificates and test reports, signed by the material producer of granular materials, indicating that the materials meet or exceed the specifications.

1.04 QUALITY ASSURANCE

Pipe or drainage system manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings specified.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Pipe shall be marked with manufacturer's identification symbol, size, date of manufacture, class of pipe and applicable product specification identification number.
- B. During loading, transporting and unloading, exercise care to prevent damage to pipe. All materials shall be inspected upon delivery to the Site. Damaged or defective materials shall be rejected and shall be replaced with new materials at no additional cost to the Project.
- C. Granular materials of different gradations (including drainage stone and choker course) shall be delivered to the Site using clean equipment, and separately stockpiled in areas approved by the Contractor. Adequately protect to preserve the materials' fitness and quality.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Proposed materials and sources of supply shall be approved by the Contractor as specified, prior to shipment and use of the materials in the construction.
- B. Granular materials shall meet specified gradations and quality prior to placement. All processing shall be completed at the source.

2.02 CHOKER COURSE

Choker course shall consist of aggregate with gradation conforming to size number 8 (nominal 3/8-inch to No. 8 sieve sizes) or size number 89 (nominal 3/8-inch to No. 16 sieve sizes) as defined in ASTM D 448 or Table 880.1 of the GDOT Standard Specifications.

2.03 DRAINAGE STONE

Washed drainage stone to be placed in bioretention areas, bioswales, and other designated stormwater quality facilities shall be washed stone conforming to the quality and gradation requirements for size number 57 coarse aggregate in ASTM D 448 or Section 800.2.01 of the GDOT Standard Specifications. Gradation shall be as summarized in the following table.

Sieve Size	Percent Passing, by Weight
1 1/2 inch	100
1 inch	95 - 100
1/2 inch	25 - 60
No. 4	0 - 10
No. 8	0 - 5

2.04 GEOTEXTILE

Specified in Section 02371.

2.05 UNDERDRAIN PIPE

- A. Underdrain pipe shall be perforated ADS Smooth Wall Sewer and Drain pipe (or approved equal) suitable for gravity flow drainage, meeting the requirements of ASTM F 810 and conforming to the following additional requirements.
- B. Pipe shall have a smooth interior and exterior and the pipe joints shall be bell and spigot with the bell ends integrally formed to provide a soil-tight connection.
- C. Pipe material shall be high density polyethylene (HDPE) conforming to the minimum requirements for cell classifications 424410C or E as defined in ASTM D 3350.
- D. Perforation pattern and spacing shall be as follows. Each perforation shall be 0.2 inch maximum diameter. Perforations shall be spaced approximately 120 degrees around the circumference of the pipe and shall be arranged in rows parallel to the axis of the pipe at spacing not greater than 3 inches.
- E. Furnish required fittings and connectors for a complete system. A cleanout shall be provided on the upstream ends of the underdrain system. Pipe material shall conform to the requirements of subsection 2.06. The cleanout shall include a 12-inch by 12-inch (or larger) by 3-inch thick minimum thickness concrete pad.

2.06 NON-PERFORATED PIPING

- A. Non-perforated piping (including upturned “S” piping, cleanouts and outlets) in designated stormwater quality facilities shall conform to one of the following specifications:
 - 1. Polyvinyl chloride (PVC) pipe and fittings conforming to ASTM D 3034, SDR 26. Joints shall conform to ASTM D 3212 with a factory-installed elastomeric gasket conforming to ASTM F 477.
 - 2. Schedule 40 PVC pipe conforming to ASTM D 1785. Fittings shall conform to ASTM D 2466.
- B. Furnish suitable fittings, transition couplings and other accessories as required for a complete installation. Transition couplings for connection of perforated corrugated polyethylene pipe (with smooth inner liner) to smooth-wall PVC pipe shall include “corrugated pipe couplings” manufactured by Fernco, Inc., or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

- A. Construction of bioretention areas, bioswales and other stormwater quality facilities shall not commence until the proposed facility area is isolated from all contributing drainage areas. Excavate in dry conditions.
- B. Erosion and sediment control measures shall be implemented to protect construction areas. Conform to codes and ordinances and the requirements of Section 02125.
- C. Locate and mark existing utilities, underground structures, and above ground obstructions before beginning installation and avoid disruption and damage of services.
- D. Excavate to the required dimensions, side slopes and depths or as approved by the City DWM’s representative. Exposed subgrade soils at bottom of excavation shall not be compacted. Low ground pressure equipment shall be used for excavation.
- E. Excavated materials shall be removed from the construction areas and placed in other locations on the Site, if needed, or off-site where approved by the Contractor.
- F. Prior to placement of choker course, drainage stone, other granular materials, and underdrain piping, the bottom of the excavation shall be dry and scarified (by raking, disking or tilling) to a minimum depth of six inches.

3.02 GEOTEXTILE INSTALLATION

Place geotextile on exposed excavated side slopes or other locations where required prior to placement of granular materials and engineered soil mix (as applicable) and as specified in Section 02371.

3.03 INSTALLATION OF GRANULAR MATERIALS

- A. Place and uniformly grade specified gradations of granular materials in sequential layers to the thicknesses and limits required. Level and contour surface of each layer to required elevations.
- B. Coordinate placement of granular materials with installation of geotextile and underdrain piping.

3.04 PIPE INSTALLATION

- A. Examine pipe and fittings before installation and assure no defective materials are incorporated. Keep inside of pipes and fittings free of dirt and debris.
- B. Install piping beginning at low points of the system, true to grades and alignment indicated, with continuous slope.
- C. Lay perforated underdrain piping on uniformly graded materials for entire length of alignment at the required locations and lengths. Installation shall be in accordance with ASTM D 2321.
- D. Install fittings and observation features as required in accordance with City DWM standards.
- E. Install non-perforated outlet pipes and valves (as applicable) at the required locations and orientation as required.
- F. Pipe and fittings shall be joined in accordance with manufacturers' recommendations and reference standards. Non-perforated pipe connections shall be watertight.
- G. Whenever pipe laying is not actively in progress, the open ends of the piping shall be closed by a temporary plug or cap to prevent soil and other foreign matter from entering the piping.
- H. For connections to storm drainage system, comply with requirements for applicable City DWM of Atlanta Storm Sewer Specifications where required.

3.05 FIELD QUALITY CONTROL

- A. Tests and Inspections: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
- B. Remove obstructions, replace damaged components, and repeat test until free flow of system is achieved.
- C. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses.

3.06 BACKFILLING

- A. Place drainage stone around and over perforated piping as required up to required elevation or depth in each area.
- B. Place soil backfill around and over non-perforated pipe in layers not exceeding six inches loose thickness up to finish grade. Each layer shall be thoroughly compacted using manually guided compaction equipment.
- C. Placement and compaction of drainage stone and other backfill materials shall be performed in a manner that will not damage the pipe. Pipe that is damaged shall be replaced at no additional cost to the Project.

3.07 MAINTENANCE AND PROTECTION

Prior to the City DWM's final acceptance of the Work, Contractor shall perform maintenance and protection of the construction as specified in this Section. In addition, for the one year warranty period, Contractor shall correct or remove and replace defective work as approved by the City DWM's representative in accordance with the terms of the Contract.

+++ END OF SECTION 02681 +++

SECTION 02682
PRETREATMENT FOR STORMWATER QUALITY FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Section includes construction of pretreatment measures that are designed to provide energy dissipation and filter out debris from surface runoff prior to flowing into stormwater quality facilities. Pretreatment measures included in this specification:
 - 1. Sediment forebays
- B. Related Work Specified Elsewhere:
 - 1. Section 02125 – Temporary and Permanent Erosion and Sedimentation Control
 - 2. Section 02371 – GI Geotextiles
 - 3. Section 02200 – Earthwork
 - 4. Section 02933 – Seeding and Sodding
 - 5. Section 02934 – Native Plug Planting
 - 6. Division 03 Specifications: For concrete construction

1.02 REFERENCES

Georgia Department of Transportation (GDOT):

“Standard Specifications, Construction of Transportation Systems”, Latest Edition (GDOT Standard Specifications)

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents.
- B. Submit the following to the City DWM as part of the Project record prior to shipment of materials to the Site:

1. Shop Drawings for structures, showing plans, sections and details.
2. Manufacturer's data (including product data sheets and test results) from manufacturers or suppliers for proposed materials showing compliance with the Specifications.

1.04 QUALITY ASSURANCE

Comply with the requirements of governmental authorities having jurisdiction.

1.05 SEQUENCING AND SCHEDULING

Coordinate construction of pretreatment measures with associated work specified in other sections.

PART 2 PRODUCTS

2.01 VEGETATION MATERIALS

- A. Topsoil (if required), fertilizer and liming materials, and mulch for turf grass shall conform to the requirements of Section 02933.
- B. Vegetation for sediment forebays shall consist of plantings as indicated on the Drawings and conforming to other requirements of the Specifications.

2.02 CONCRETE

Concrete formwork, reinforcement, concrete materials and mix design for curb inlets, splash pads and other concrete structures shall conform to the applicable requirements of Division 3 Specifications. Unless otherwise specified, minimum compressive strength of concrete shall be 3,000 psi.

2.03 RIPRAP

Riprap shall consist of hard, angular shaped stone complying with the quality requirements of Section 805.2.01 of the GDOT Standard Specifications.

2.04 RIVER COBBLES

River cobbles shall be locally available smooth water-washed river rock ranging in size from approximately 3-inch to 8-inch diameter.

PART 3 EXECUTION

3.01 PREPARATION

- A. Establish required dimensions and elevations for pretreatment facility construction.
- B. Erosion and sediment control measures shall be implemented to protect construction areas. Conform to the codes and ordinances and Section 02125.
- C. Excavate and grade existing materials as required for construction of the facilities in accordance with applicable requirements of Section 02200 and other specification sections.

3.03 SEDIMENT FOREBAY CONSTRUCTION

- A. Sediment forebays shall be constructed where concentrated flow is directed to a stormwater quality facility through curb turnouts or pipe outlets.
- B. Sediment forebays shall be constructed as required and specified below.
 - 1. Each forebay shall be sized to contain 0.1 inch of runoff per impervious acre of contributing drainage. The forebay storage volume counts toward the total water quality storage requirements.
 - 2. Exit velocities from the forebay shall be non-erosive.
 - 3. Direct maintenance access for appropriate equipment shall be provided to the forebay.
 - 4. A fixed vertical sediment depth marker shall be installed in the forebay to measure sediment deposition over time.
 - 5. Sediment removal in forebay shall occur when 50 percent of the total capacity has been lost.
- C. Coordinate sediment forebay construction with adjacent stormwater quality facility and additional pretreatment and energy dissipation measures to provide required control of erosion and other protection of the forebays.
- D. If required, the bottom of the forebay shall be lined with concrete, paver blocks or other approved hard materials to facilitate removal of sediment.

- E. Side slopes and top of slopes (not including inflow areas and overflow spillway) shall be armored with stone or other hard material, or stabilized with approved vegetation as required and specified in Section 02933.
- F. A stabilized overflow spillway (lined with concrete, riprap or other approved armoring materials) shall be constructed where water flows between each forebay and adjacent stormwater quality facility.
- G. Install vertical sediment depth markers in forebays as required.

3.04 MAINTENANCE AND PROTECTION

- A. Prior to the City DWM's final acceptance of the Work, Contractor shall perform maintenance and protection of the construction as specified in this Section. In addition, for the one year warranty period, Contractor shall correct or remove and replace defective work as approved by the City DWM's representative in accordance with the terms of the Contract.
- B. Remove construction debris and protect areas from erosion and other damage until completion of the Project.
- C. Damage to the constructed areas shall be fully repaired as approved by the City DWM's representative.

+++ END OF SECTION 02682 +++

**SECTION 02700
REMOVING AND REPLACING PAVEMENT**

PART 1 GENERAL

1.01 SCOPE

- A. The work under this Section includes, but it is not necessarily limited to, the removal and replacement of all asphalt paving materials as necessary for the completion of the Work.
- B. This section also includes pavement milling and application of a new surface course over the entire width of existing pavement or to other widths as directed by the Engineer.
- C. This section also includes removing and replacing existing sidewalks, steps, patios, curbs, and gutters in areas where such have been removed for construction of pipelines and appurtenances.
- D. Existing pavement, sidewalks, curbs, and gutters shall be replaced to meet the current City DWM of Atlanta standards, or to match existing pavement sidewalk, curb, or gutters, whichever is more stringent.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:
 - 1. Batch design.
 - 2. Density and viscosity tests on each run.
 - 3. Weight slips for pavement base and asphalt paving materials.
- B. Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

1.03 CONDITIONS

- A. Weather Limitations
 - 1. Apply bituminous tack coat only when the ambient temperature in the shade has been at least 40 degrees F for 12 hours immediately prior to application.

2. Do not conduct paving operations when surface is wet or contains excess moisture that would prevent uniform distribution and required penetration.
 3. Construct asphaltic courses only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
 4. Place base course when air temperature is above 40 degrees F and rising. Do not place base on a frozen or muddy subgrade.
- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.
- C. Traffic Control
1. The Contractor shall maintain vehicular and pedestrian traffic during paving operations and as required for other construction activities.
 2. The Contractor shall provide flaggers, barricades and warning signs for the safe and expeditious movement of traffic through the construction zone within the public right-of-way in accordance with the requirements of **Section 01550**.

1.04 QUALITY ASSURANCE

- A. All work under this Section shall be performed in accordance with the current Georgia Department of Transportation Standard Specifications.
- B. The Contractor shall use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete and shall be a GDOT approved facility.

1.05 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the City DWM.

1.06 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with the requirements of the General Conditions.

- B. The City DWM's independent testing laboratory shall take samples and perform tests in accordance with the Georgia Department of Transportation Standard Specifications.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: All materials and products for the work under this Section shall conform to the current Georgia Department of Transportation Standard Specifications except as otherwise specified herein.
- B. Graded Aggregate Base: Graded aggregate base shall be Class A meeting the requirements of the Georgia Department of Transportation Specification Section 815.01. Graded aggregate base shall be compacted to a minimum of 95% Standard Proctor Density (ASTM D698).
- C. Prime Coat: Prime coat shall be in accordance with Section 412 of the Georgia Department of Transportation Standard Specifications.
- D. Base: The base for all paved roadways shall conform to the requirements of the Georgia Department of Transportation Specifications for the hot mix asphalt Section 828, Type "B".
- E. Tack Coat: Tack coat shall conform to Section 413 of the Georgia Department of Transportation Standard Specifications.
- F. Surface Course
 - 1. The surface course for all pavement, including prime and tack coat shall conform to the requirements of the Georgia Department of Transportation Specifications for Asphaltic Concrete, Section 828, Type "E".
 - 2. Surface course for pavement within GDOT right of way shall be Superpave as specified in Section 828 of the GDOT Standard Specifications. Thickness shall be 12.5 mm.
- G. Special Surfaces: Where existing pavement, sidewalks, steps, patios, curbs, or gutters are disturbed or damaged which are constructed of specialty type surfaces, e.g., brick or stone, these facilities shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty Contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

2.02 PAVEMENT MARKINGS

- A. Pavements markings shall be either pavement paint or thermoplastic reflectorized pavement marking compound.
 - 1. Pavement Paint: Pavement paint shall be No. 5A White Traffic Line Paint and No. 5B Yellow Traffic Line Paint as described in and conforming to the requirements of Article 652 of the Georgia Department of Transportation Standard Specifications.
 - 2. Pavement Marking Compound: Thermoplastic reflectorized pavement marking compound shall be as described in and conform to the requirements of Article 653 of the Georgia Department of Transportation Standard Specifications.
- B. Pavement markings shall include, but not be limited to the following:
 - 1. Double solid yellow center line.
 - 2. Solid white pavement edge line where street does not have curb and to mark bicycle lane.
 - 3. Skip yellow lines to designate lanes in multi-lane streets.
 - 4. White crosshatch lines for crosswalks at schools and at intersections.
 - 5. White stop bars at stop streets.
 - 6. Symbols such as turn arrows one way arrows, etc.
 - 7. Wording such as “STOP”, “SCHOOL”, etc.
- C. Traffic stripe shall be 6-inches wide on Georgia Department of Transportation streets and City streets designated as arterial. Traffic stripe shall be 4-inches wide on all other streets.

PART 3 EXECUTION

3.01 REMOVING PAVEMENT

- A. General: Remove existing pavement and base as necessary for trench excavation and installation of pipeline and appurtenances.
- B. Remove and replace pavement and base beyond pipeline trench to outer edge of existing pavement if remaining existing pavement width is 24-inches or less from

side of trench to outer edge of pavement or roadway.

- C. Marking: Before removing any pavement, mark the pavement neatly paralleling pipelines and existing street lines.
- D. Saw Cutting: Under no circumstances shall the Contractor be allowed to remove concrete or asphalt without prior saw cutting. Asphalt pavement shall be saw cut along the marks using suitable equipment. The saw cutting shall be deep enough to produce an even, straight cut.

Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.

Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

- E. Sidewalks and Patios: Remove and replace any sidewalks or patios disturbed by construction for their full width and to the nearest undisturbed joint.
- F. Curbs and Gutters: Tunnel under or remove and replace any curb and/or gutter, which is disturbed by construction to the nearest undisturbed joint.
- G. Steps: Completely remove and replace any steps, constructed of concrete or special surfaces, which are disturbed by construction.

3.02 TYPES OF PAVEMENTS

- A. General: All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existed prior to construction. Materials, equipment and construction methods used for paving work shall conform to the Georgia Department of Transportation specifications applicable to the particular type required for replacement, repair, or new pavements.
- B. Graded Aggregate Base: Aggregate base shall be constructed in accordance with the requirements of the Georgia Department of Transportation Standard Specifications. The maximum thickness to be laid in a single course shall be 6-inches compacted. If the design thickness of the base is more than 6-inches, it shall be constructed in two or more courses of approximate equal thickness. After the material placed has been shaped to line, grade, and cross section, it shall be rolled until the course has been uniformly compacted to at least 100 percent of the maximum dry density when Group 2 aggregate is used, or to at least 98 percent of maximum dry density when Group 1 aggregate is used.
- C. Concrete Pavement: Concrete pavement or base courses shall be replaced with concrete. The surface finish, joint pattern and joint sealant of the replaced concrete

pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the same types and dimensions as those removed. Concrete pavements or concrete base courses shall be reinforced. Reinforcing bars and concrete shall conform to the requirements of Section 03200, Concrete Reinforcement and Section 03300, Cast-In-Place Concrete. Concrete for pavement shall be 3000 psi.

- D. Asphaltic Concrete Base, Bituminous Tack Coat, and Surface Course: Asphaltic concrete base, tack coat, and surface course construction shall conform to Georgia Department of Transportation Standard Specifications. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared; surface is intact, firm, properly cured, dry and the tack coat has been applied. Apply and compact the base in maximum layer thickness by asphalt spreader equipment. After compaction, the black base shall be smooth and true to established profiles and sections. Immediately correct any high, low, or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.
- E. Surface Treatment Pavement: Bituminous penetration surface treatment pavement shall be replaced with the thickness indicated on the Drawings.
- F. Gravel Surfaces: Existing gravel road, driveway and parking area replacement shall meet the requirements of graded aggregate base course. This surfacing may be acceptable as a temporary surface for paved streets until replacement of permanent pavement is authorized.

3.03 TEMPORARY ROADWAY SURFACES

- A. After installation of pipeline and appurtenances, the trench shall be backfilled in accordance with the requirements of Section 02225, Trench Excavation and Backfill.
- B. The Contractor shall be required to install and maintain temporary roadway surfaces over all roadway cuts at the end of each day's work if the road is to be opened for traffic when work is not in progress. Temporary roadway surfaces shall consist of either temporary cold asphalt patch, aggregate base course or steel plates over the trench. The surface to be installed shall be selected by the Contractor and approved by the City Department of Public Works.
 - 1. Temporary Patch Paving: Temporary patch paving shall be placed on the aggregate base course and shall conform to the existing road surface. Prior to installation of permanent pavement, the temporary patch, and aggregate base course, if necessary, shall be removed to the required depth and

leveled to allow for permanent pavement replacement of the thickness as shown on the Drawings.

2. Aggregate Base Course: Aggregate base course surface shall conform to the existing road surface and shall be maintained at grade, dust free, by the Contractor. Prior to installation of permanent pavement, the aggregate base course shall be removed to the required depth and leveled to allow for permanent pavement replacement of the thickness as shown on the Drawings.

3.04 STEEL TRAFFIC PLATES

Following completion of pipeline installation including backfilling but prior to replacement of pavement, steel plates may be used to temporarily carry vehicular traffic. Requirements for utilization of steel plates shall be as follows:

1. Steel plates shall not be allowed in GDOT right of way where the posted speed limit is 45 mph or greater.
2. Trench shall be backfilled and compacted to within ten (10) inches from top of existing pavement prior to placing the steel plate.
3. Steel plates shall meet ASTM structural specifications having "A36" designation with minimum yield stress of 36 ksi (ksi = kilopounds per square inch).
4. Steel plates shall extend a minimum of 12-inches beyond all edges of the trench.
5. In streets and roads where the posted speed is 44 mph or less, asphaltic patching material (cold mix) shall be used to secure the steel plate around its edges. The asphaltic concrete shall be compacted to form ramps with a minimum 12-inch taper to cover all edges of the steel plate.
6. In streets and roads where the posted speed is 45 mph or greater, the approach plate and ending plate shall be attached to the road surface by a minimum of 4 Hilti type anchors predrilled into each corner of the plate and drilled a minimum of 4-inches into the pavement. Asphaltic patching material (cold mix) shall be used to secure the steel plate around its edges. The asphaltic concrete shall be compacted to form ramps with a minimum 12-inch taper to cover all edges of the steel plate. When the plates are removed, the dowel holes in the pavement shall be backfilled with asphalt concrete mix or concrete.
7. No plate shall be allowed over a trench having a width greater than 48 inches when adequate soil conditions are present. When the trench is

greater than 48 inches, the entire lane containing the trench shall be closed. Before closing a lane, a Lane Closure Permit shall be obtained from the City of Atlanta, Department of Public Works, Bureau of Traffic and Transportation. At least 24 hours prior notification is required for the Lane Closure Permit.

8. The width of a trench is measured normal to the length of the trench. The largest reading of the measurements is the determining factor for width. For a series of steel plates on any continuous trench, all plates shall have the same thickness.
9. All necessary warning signs, barricades, and lights shall be adequately provided and placed for the safety of the public and in full conformity with the latest edition of the MUTCD at no additional cost to the City DWM.
10. Trench shall be fully covered with a minimum of twelve (12) inches of asphalt taper on all sides of the plate.
11. After water service connections are transferred from the existing main to the new main, the maximum time that steel plates shall remain in place is as follows:
 - (a) In City streets – 7 consecutive days
 - (b) In GDOT right-of-way - 4 consecutive days
12. Upon the completion of the work and removal of the steel plates, the existing surface shall be cleaned and pavement replaced as specified hereinafter.
13. In the event the steel plates are not removed and pavement restoration initiated within the above specified time frames, the City and GDOT reserve the right to remove the steel plates and replace the pavement at the expense of the Contractor.

3.04 TESTING OF SUBGRADE

- A. Trench backfill shall be compacted for the full width and depth of the trench as specified in Section 02225.
- B. Upon completion of backfilling and compaction of the backfill, the Contractor shall arrange to have the compaction tested by an independent testing laboratory. Compaction testing shall be as specified in Section 02225.
- C. After compaction testing has been satisfactorily completed, replace all pavements,

sidewalks, and curbs and gutters removed.

- D. Tests repeated because the compacted backfill, subgrade or base does not meet the specified compaction shall be paid for by the Contractor and will not be reimbursed by the City DWM.

3.06 PAVEMENT REPLACEMENT

A. Limits of Pavement Replacement

1. City Streets

- (a) The existing street pavement or surface shall be milled for the full width of the affected travel lane. The depth of milling shall be 2-inches.
- (b) Milling shall be performed as specified in Section 432 of the GDOT Standard Specifications.
- (c) 2-inch thick pavement shall be applied over entire milled area to restore the existing roadway to the same elevation that existed prior to construction.

2. GDOT Right of Way

- (a) The existing street pavement or surface shall be milled from curb to curb or to other limits as specified by the City DWM or GDOT. The depth of milling shall be 2-inches.
- (b) Milling shall be performed as specified in Section 432 of the GDOT Standard Specifications.
- (c) Superpave shall be applied over entire milled area to restore the existing roadway to the same elevation that existed prior to construction.

B. Preparation of Subgrade

- 1. If the temporary aggregate base surface is to be replaced, it shall be removed and the graded aggregate base surfacing for unpaved streets or the base for the bituminous surface shall be placed.
- 2. Following this preparation, the graded aggregate base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.

3. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary aggregate base surface and any necessary backfill material, additional existing paving and new excavation shall be removed to the depth and width as required. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and graded aggregate bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.
4. Where driveways or roadways, constructed of specialty type surfaces, e.g., brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces dictate, a specialty Contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

C. Pavement Placement and Resurfacing

1. After all pipe line installations are complete and subgrade has been placed as specified in Paragraph 3.06.B above, apply tack coat and surface course as specified herein.
2. Resurfacing limits shall be perpendicular to the road centerline.
3. Where pavement is damaged with potholes, the Contractor shall remove all existing loose pavement material and fill the hole with black base, as specified, to the level of the existing pavement.
4. Placement of pavement shall conform to City DWM standards and GDOT standard specifications.

3.07 ADJUSTING EXISTING STRUCTURES

Existing manholes, inlets, valve boxes etc. within the limits of construction, which do not conform to the finished grade of the proposed pavement or the finished grade shall be cut down or extended and made to conform to the finished grade.

3.08 SIDEWALK, WHEELCHAIR RAMP AND CURB AND GUTTER REPLACEMENT

- A. All sidewalks, wheelchair ramps and curbs and gutters damaged by the Contractor shall be replaced by the Contractor at no expense to the City DWM.
- B. Refer to section 02302 for granite curb construction.

- C. Refer to Section 02521 for concrete sidewalk, wheelchair ramp construction, and concrete curb and gutter construction.

3.09 TRAFFIC DETECTION LOOPS

- A. Replacement and/or repair of damaged traffic detection loops shall be constructed and tested in accordance with the requirements of Section 647 of the Georgia Department of Transportation Standard Specifications.
- B. The Contractor shall coordinate the testing of all traffic detection loops with the City of Atlanta Department of Public Works and/or GDOT to ensure the functionality of all traffic signals affected by the Work.

3.10 PAVEMENT MARKINGS

- A. Pavement marking shall be applied to pavement in the same pattern that existed prior to construction. All final markings shall meet the requirements of the Manual of Uniform Traffic Control Devices (MUTCD) and GDOT Standard Specification Sections 652 and 653.
- B. Pavement surfaces on which paint will be applied shall be examined for conditions that would adversely affect application of paint, permanence and quality of work. Paint shall be thoroughly mixed before being applied.
- C. Pavement surfaces on which paint will be applied shall be free from moisture, dirt, dust grease, oil and all other foreign matter immediately before paint is applied. Cleaning equipment shall not damage the pavement.
- D. Paint wet film thickness shall not be less than 15 mils.
- E. Thermoplastic traffic stripe shall consist of solid or broken (skip) lines, words and/or symbols of the type and colors shown in the MUTCD Manual. Short lines such as crosswalks, stop bars, arrows, symbols and crosshatching shall be extruded. All other lines shall be sprayed.
- F. Pavement markings which fail to present a satisfactory appearance or to otherwise meet the requirements of this section shall be corrected by removing the affected portion and by painting a new marking in accordance with the requirements of this Section.

3.11 INSTALLATION

- A. Asphaltic construction shall be performed in accordance with Section 400 of the Georgia Department of Transportation Standard Specifications.

- B. Place each course in the required quantities so that when compacted, they will conform to the indicted grade, cross section and minimum thickness (see section 3.01-3.06).

3.12 CLEANING AND PROTECTION

Prior to acceptance of the work of this Section, clean the pavement and related areas. The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition.

3.13 APPROVAL AND ACCEPTANCE

- A. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.
- B. Obtain the City DWM approval of restoration of pavement, such as private roads and drives that are not the responsibility of a regulatory agency.
- C. Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.
- D. Prior to acceptance and approval of any asphaltic concrete binder and/or topping which is installed for the purpose of City maintenance, a representative of the City of Atlanta's Department of Traffic and Transportation may require one or all of the following tests: 1) coring, 2) extraction, 3) compaction and 4) density. The frequency and location of these tests will be at the discretion of the Engineer.

3.14 MAINTENANCE

- A. The Contractor shall maintain the surfaces of roadways and pavements replaced until the acceptance of the Project. Maintenance shall include replacement, scraping, reshaping, milling, overlapping, and re-rolling as necessary to prevent raveling of the road material, the preservation of smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the City DWM.
- B. Maintenance shall also include sprinkling as may be necessary to abate dust from the gravel surfaces.

+++ END OF SECTION 02700 +++

SECTION 02900
TREES, SHRUBS, PERENNIALS AND GROUND COVER GENERAL

1.1 DESCRIPTION OF WORK

- A. The work covered under this section applies to furnishing all equipment, materials, and labor necessary for soil preparation; planting of trees, shrubs, herbaceous perennials, ground cover, bare root plants, procurement and proper installation of live stakes, dormant woody cuttings, as applicable; protection, maintenance, warranty, and replacement of plants; and all related items.
- B. It is not contemplated that planting shall occur where the depth of soil over underground construction or obstructions is insufficient to accommodate the roots or where impervious soil will require drainage. Where such conditions are encountered in excavation of planting areas, other locations for underground construction or for the planting may be designated by the City DWM.
 - 1. Removal of underground obstructions, relocation of underground construction and provision of drainage for planting areas shall be done only as directed by the City DWM.
 - 2. If changes in the location of the work or if removal of obstructions involve additional work, the Contractor shall proceed in accordance with the "General Conditions" of the Contract for construction.
- C. All planting shall be performed by personnel with experience with these planting procedures and under the supervision of a qualified planting foreman capable of executing the requirements of this specification.
- D. The Contractor shall take all necessary precautions to avoid damage to existing sidewalks, fencing, paving, curbs, lighting, and other site improvements and Contractor shall replace any existing site improvements damaged by his operations at his own expense to match the pre-damaged condition.

1.2 QUALITY ASSURANCE

- A. Size, quality, root ball preparation, and grading standards shall conform to the American Association of Nurserymen, Inc., as published in the "American Standard for Nursery Stock," ANSI Z60.1, latest approved revision.
- B. Plant names indicated comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.
- C. The Contractor shall be responsible for all certificates of inspection of plant materials that may be required by federal, state, or other authorities to accompany shipments of plants.
- D. Fertilizer shall conform to the local, state, and federal laws applicable to its manufacture and labeling.

1.3 PLANT WARRANTY AND REPLACEMENT

A. Warranty

1. Plants shall be alive, healthy, and vigorous at the end of the warranty period in accordance with the Planting Warranty.
2. The warranty period for all plant material other than trees planted as “recompense” shall be for a period of one full calendar from Final Completion and City DWM final acceptance of the plants. Warranty period for “recompense trees” shall be for a period of two full calendar years after Final Completion and City DWM final acceptance of the plants.
3. Contractor is required to control weeds and invasive species that threaten the survival of all installed plantings.

B. Replacement

1. Live stake, bare rooted and containerized plants and shrubs shall have a one year warranty after Final Completion and acceptance of each contract item as listed in bid package.
2. Recompense trees shall have a two full calendar year warranty after Final Completion and acceptance of each contract item as listed in bid package. Recompense trees will be inspected after one year. Replacement recompense trees will have an additional one year warranty. Any replacement recompense trees requiring replacement after 2 years will have an additional 60 day warranty.

PART 2 PRODUCTS

2.1 PLANTS

- A. The names of plants required under this contract conform to those given in “Standardized Plant Names,” latest edition, prepared by American Joint Committee on Horticultural Nomenclature. Each plant shall be tagged or labeled at the source with full botanical name on a waterproof tag.
- B. Plant specimens shall conform to those specified and two specimens of each plant shall be furnished at City DWM’s request for inspection.
- C. Plants shall be native species which is defined as propagated from or harvested from regionally adapted stock and plant species or genotypes which are native to a range of within 200 miles of the Project site. , and have a habit of growth that is normal for the species. They shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the plantings list as indicated on the Drawings, which are minimum acceptable sizes. They shall be measured before pruning with branches in normal position. Plants shall not be pruned back to such an extent that they no longer meet specifications. All trees and shrubs shall have been transplanted or root pruned at least once in the 3 years previous to contract date. Root bound container plants will not be accepted.

- D. Substitutions of genus, species, or variety will be permitted only upon submission of proof, in writing, that the specified plant or its alternative is not obtainable in the continental United States.
- E. Bare root plants and plants used for branch layering or live stakes may be field collected in a legal manner.
- F. All balled and burlapped trees shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Balls shall be firmly wrapped with burlap or similar material and bound with twine, cord or wire mesh. Where necessary to prevent breaking or cracking of the ball during the process of planting, the ball may be secured to a platform.
- G. Container grown plants shall be healthy, vigorous, well-rooted, and shall have become established in the container in which they are delivered. These plants shall have been in the established container long enough for the fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container. No plants shall be loose in the container and shall not be pot bound. Containers shall be sufficiently rigid to firmly hold the soil protecting the root during transporting, handling, and planting.

2.2 MISCELLANEOUS MATERIALS

- A. Water shall be free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.
- B. Mulch shall be shredded hardwood mulch as defined in Section 02922 or tightly baled pine straw which is clean, fresh, dark reddish-brown, and free of branches, cones, foreign matter, insects and disease.
- C. Fertilizer shall be as recommended by soil analysis and as specified within Section 3.3 G and 3.5A, within these specifications.
- D. Stakes for securing container or balled and burlapped trees in the ground shall be a minimum of 24-inches in length, 2-inches x 2-inches wooden stakes. Wooden stakes shall be rot resistant wood, e.g., redwood, oak, western cedar, or pressure treated southern pine.

PART 3 EXECUTION

3.1 SOIL PREPARATION

Prior to planting, soil samples shall be taken within each planting zone (minimum of one per 5,000 square ft.) and include a composite sample of each zone with a minimum of four subsamples per instructions from the UGA Extension Service and be analyzed for the appropriate parameters by the UGA Extension Service or State approved soil analytical laboratory. All soil sample results shall be submitted to the City DWM for their records. The Contractor shall add the appropriate amount of the deficient elements to the soil prior to planting.

3.2 TIME OF PLANTING

When other sections of the work have progressed sufficiently to commence the work of planting, planting operations shall be conducted immediately under favorable weather conditions. These seasons shall be as follows:

1. Permanent Seed
 - a. Permanent seed shall be planted between March 1 and June 1, or September 1 and October 31, depending on the type of grasses.
 - b. Follow recommendations of seed supplier.
2. Shrubs and Trees (container plantings)
 - a. Planting shall occur between November and March, preferably after the first frost
3. Shrubs and Trees (bare root plantings)
 - a. Planting shall occur between November and March, preferably after the first frost
4. Other Ground Cover
 - a. Planting shall occur between November and March
5. At the option and on the full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

3.3 PRODUCT HANDLING AND STORAGE

Balled and burlapped plants shall be dug and prepared for shipment in a manner that will not damage roots or branches. The balls or roots of plants not planted immediately on delivery shall be covered with moist soil or mulch, or other protection from drying winds and sun. All plants shall be watered as necessary, until planted. Balled plants shall not be lifted by the trunk of the plant.

3.4 PLANTING OF, TREES, SHRUBS, PERENNIALS, BARE ROOTS, AND GROUND COVER

- A. Except as otherwise specified, the Contractor's work shall conform to accepted horticultural practices as used in the trade.
- B. Live stakes, trees, shrubs, balled and burlapped, containerized plants and seed mixtures shall be planted during their individual dormant seasons, as directed in the planting schedule, or as advised by a commercial plant supplier. Trees, shrubs, balled and burlapped, containerized plants shall be installed per the recommendations shown on the individual labels and as directed in the planting schedule, or as advised by a commercial plant supplier.
- C. Planting pits shall be dug and soil for planting readied before plants are delivered. Pits shall be at least twice the diameter of the root ball or container.
- D. Set plant material in the planting pit to proper grade and alignment. If fabric is used in container plants, remove first before setting in pit. Set plants upright, plum, and no lower than the finished grade or 2-3 inches above finished grade. Add excavated pit material to fill

approximately half of the pit. Fill rest of pit soil and bring to finished grade. Lightly compact fill around root ball and be sure to fill all voids. No filling will be permitted around trunks or stems.

- E. All plants shall be set on prepared soil to such depth that the finished grade level at the plant after settlement will be the same as that at which the plant has grown. They shall be planted upright and plumb. Platforms, wire and burlap for top and sides of the ball as shown on the Details shall be removed. If synthetic fabric is used instead of burlap, all fabric should be removed prior to planting. All broken, frayed, or circling roots shall be cut off cleanly. Soil shall be placed and compacted carefully to avoid injury to roots and to fill voids. When the hole is nearly filled, add water as necessary and allow it to soak away. Fill the hole to finish grade. After the ground settles additional soil shall be filled to the level of the finished grade.
- F. Live stakes shall be installed using a dead blow (shot or sand filled) hammer or rubber mallet to tamp the stakes into the ground, only when the soil is too hard or rocky to allow direct driving of stakes. Stakes should be embedded at least 2/3 of their length.
- G. All trees, shrubs, perennials, ground cover, bare root plants, and branch layer plants shall be installed per the City DWM standards.
- H. Excess excavated soil from planting operations shall be removed from the site and properly disposed of by the Contractor.
- I. All containerized plants shall be fertilized per soil test recommendations within 2 days of installation. Balled and burlapped trees and shrubs shall not be fertilized for the first year after planting.
- J. If applicable, staking shall be accomplished to support plantings per industry and City DWM standards. Supports shall be removed immediately after the warranty period.
- K. All plants shall be mulched with a 3-inch minimum layer of mulch within 2 days of planting. This mulch shall entirely cover the area of the planting pit, bed, or saucer around each plant.
- L. Contractor shall furnish sequencing report to City DWM showing branch layering installation sequencing, including but not limited to, method of creating branch material, soaking timeframe and location, and handling of material prior to being planted.

3.5 PRUNING AND REPAIR

Upon completion of the work under the contract, all new trees and shrubs shall have been pruned and any injuries repaired. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs. On all bruises or scars on the bark and cuts over 3/4-inch in diameter, the injured cambium shall be traced back to living tissue and removed; wounds shall be smoothed and shaped so as not to retain water.

3.6 INSPECTION FOR ACCEPTANCE

Upon completion of all planting and after written notification, inspection of the landscape work to determine partial completion of the contract work, exclusive of maintenance and replacement of plants, will be made by the City DWM. Inspection of the work will be made again by the City DWM at the end of the warranty period.

3.7 MAINTENANCE

Maintenance shall begin immediately after each plant is planted and shall continue until final acceptance is established by the City DWM. Planting shall be protected and maintained as necessary by watering, fertilizing, and replanting as necessary throughout the period.

+++ END OF SECTION 02900 +++

**SECTION 02920
SITE RESTORATION**

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall provide all, labor, materials, equipment and incidentals required for all site restoration and related operations necessary.
- B. This section includes disposition of materials and structures encountered in the Work, all cleanup and any other similar, incidental, or appurtenant operations which may be necessary to properly complete the Work.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM for the Project record:

- 1. The Contractor shall submit certificates of inspection as required by government authorities. The Contractor shall submit other data substantiating that materials comply with specified requirements.
- 2. The Contractor shall submit instructions recommending procedures to be established by the City DWM for maintenance of site restoration work for one (1) full year.

1.03 QUALITY ASSURANCE

- A. The Contractor shall ship site restoration materials with certificates of inspection required by authorities having jurisdiction. The Contractor shall comply with regulations applicable to site restoration materials.
- B. If specified site restoration materials are not obtainable, the Contractor shall propose equivalent material for City DWM consideration.

1.04 SAFETY REQUIREMENTS

- A. Hazards Control:
 - 1. The Contractor shall store volatile wastes in covered metal containers, and remove from the site of the Work daily.

2. The Contractor shall prevent accumulation of wastes that create hazardous conditions.
 3. The Contractor shall provide adequate ventilation during use of volatile or noxious substances.
- B. The Contractor shall conduct cleaning and disposal operations in compliance with local ordinances and environmental laws and regulations.
1. The Contractor shall not burn or bury rubbish and waste materials on the site.
 2. The Contractor shall not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditches or storm or sanitary drains.

1.05 DELIVERY

The Contractor shall deliver packaged materials in containers showing weight, analysis, and name of manufacturer. The Contractor shall protect materials from deterioration during delivery and while stored at the site of the Work.

PART 2 PRODUCTS

(NOT USED)

PART 3 EXECUTION

3.01 DISPOSITION OF MATERIALS AND STRUCTURES ENCOUNTERED IN THE WORK

- A. Existing materials or structures that may be encountered (within the lines, grades, or trenching sections established for completion of the Work), shall either be disposed of by the Contractor or shall remain the property of the City DWM as further provided in this section.
- B. At the option of the City DWM, any existing materials or structures of "value" encountered in the Work shall remain the property of the City DWM. The term "value" shall be defined by the City DWM.
- C. Any existing materials or structures encountered in the Work, and determined not to be of "value" by the City DWM, shall be legally disposed of by the Contractor.

3.02 JOB CONDITIONS

- A. The Contractor shall determine the locations of underground utilities and perform Work in a manner which will avoid possible damage. The Contractor shall hand excavate, as

required. The Contractor shall maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

- B. All bare earth areas within the limit of work shall be grassed, mulched, or covered with other plant material.
- C. On a continuous basis, the Contractor shall maintain the site of the Work free from accumulations of waste, debris, and rubbish caused by his operations.
- D. At completion of the Work, the Contractor shall remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces. The Contractor shall leave the site of the Work clean and ready for occupancy or use.
- E. The Contractor shall proceed with the complete site restoration work as rapidly as portions of the site of the Work become available, working within seasonal limitations for each kind of site restoration work required. The Contractor will not be allowed to postpone cleanup and seeding or sodding until the end of the Work.
- F. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, the Contractor shall remove the material and backfill with suitable material.
- G. The Contractor shall install materials during normal planting seasons for each type of site restoration work.
- H. The Contractor shall plant or replace trees and shrubs after final grades are established and prior to planting of lawns. If planting of trees and shrubs occurs after lawn work, the Contractor shall protect lawn areas and promptly repair damage to lawns resulting from planting operations. Refer to Section 02900.
- I. The Contractor may, at his option, employ additional measures (other than those specified) to prevent loss of, or damage to the Work resulting from the effects of wind and/or water. No additional compensation will be made for the employment of such additional measures.

3.03 CLEANUP

- A. During site restoration work, the Contractor shall keep pavements clean and the site of the Work in an orderly condition.
- B. The Contractor shall protect site restoration work and materials from damage due to site restoration operations, operations by other contractors, and trades and trespassers. The Contractor shall maintain protection during installation and maintenance periods. The Contractor shall treat, repair, or replace damaged site restoration work.
- C. Immediately upon completion of any section of the Work and before payment therefore

has been made, the Contractor shall remove from the site of the Work all construction equipment, temporary structures, and debris, and shall restore the site of the Work to a condition equal to or better than that which existed prior to construction. Waste materials shall be disposed of at locations satisfactory to the City DWM or affected regulatory agencies.

- D. The Contractor shall not remove barricades and warning and direction signs until directed by the City DWM.
- E. After completion of all Work required by the Contract and before final payment has been made, the Contractor shall make a final cleanup of each separate part of the Work; shall restore all surfaces to a neat and orderly condition; and shall remove all construction equipment, tools, and supplies.

3.04 INSPECTION AND ACCEPTANCE

- A. When site restoration work is completed, including maintenance, the City DWM will, upon request, make an inspection to determine acceptability.
- B. Where inspected site restoration work does not comply with the Contract requirements, the Contractor shall replace such work and continue specified maintenance until re-inspected by the City DWM and found to be acceptable. The Contractor shall remove rejected plants and materials promptly from the site of the Work.

+++ END OF SECTION 02920 +++

**SECTION 02922
AMENDED SOIL AND MULCH**

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Section includes furnishing and installation of amended soil (engineered soil mix) and mulch for bioretention areas, bioswales and other stormwater quality facilities.
- B. Related Work Specified Elsewhere in the Existing COA DWM Specifications:
 - 1. Section 02125 – Temporary and Permanent Erosion and Sedimentation Control
- C. Related Work Specified Elsewhere in the Green Infrastructure Specifications:
 - 1. Section 02371 – Green Infrastructure Geotextiles
 - 2. Section 02681 – Subdrainage for Stormwater Quality Facilities

1.02 REFERENCES

ASTM International:

- 1. ASTM C 33, Standard Specification for Concrete Aggregates
- 2. ASTM D 2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- 3. ASTM D 3385, Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer
- 4. ASTM D 4542, Standard Test Method for Pore Water Extraction and Determination of the Soluble Salt Content of Soils by Refractometer
- 5. ASTM D 4972, Standard Test Method for pH of Soils
- 6. ASTM D 5268, Standard Specification for Topsoil Used for Landscaping Purposes

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract.
- B. Submit the following to the City DWM for the Project record prior to shipment of materials to the Site:

1. Written documentation from manufacturers or suppliers for materials to be furnished under this Section. Include description of origin and composition of the materials.
2. Material test results including infiltration rate. Source quality control test results.
3. Minimum 1 gallon samples of proposed materials.

1.04 QUALITY ASSURANCE

Contractor shall retain the services of an independent soil testing firm to perform testing of engineered soil mix as specified in this Section.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in a manner to prevent damage and deterioration.
- B. Engineered soil mix and mulch shall be delivered to the Site using clean equipment, and separately stockpiled at the Site. Adequately protect to preserve the materials' fitness and quality.

1.06 PROJECT CONDITIONS

Conform to the specifications in this Section for required environmental conditions for construction work, including site moisture conditions, ambient temperature.

1.07 SCHEDULING

Coordinate furnishing and placement of specified materials with related construction work specified in other referenced specification sections.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. The independent testing firm shall sample and analyze proposed engineered soil mix as specified in this Section.
- B. Tests on amended soil shall be performed once per location for pH and organic content. Tests for remaining parameters are required for every 500 cubic yards of soil mix, and at a minimum once per location.

2.02 ENGINEERED SOIL MIX

- A. Engineered soil mix shall consist of a mixture of sand, clay, silt and organic matter meeting the following specifications:
1. Classified as a sandy loam or loamy sand.
 2. Sand Content: 70%-80%% clean washed sand (dry weight basis), conforming to the gradation requirements for fine aggregate in ASTM C 33.
 3. Fines (Clay and Silt) Content: Not greater than 10% including topsoil (dry weight basis).
 4. Topsoil: 10%- 20% (dry weight basis).
 5. Compost: 5% to 10% (dry weight basis).
 6. Infiltration rate: At least 1 inch per hour, and preferred rate of 1 to 2 inches per hour (as determined using ASTM D 3385).
 7. pH: 5.5 to 6.5 (as determined using ASTM D 4972).
 8. Organic Content: 3 to 10 percent (as determined using ASTM D 2974).
 9. Concentration of Soluble Salts: Not to exceed 500 ppm (as determined using ASTM D 4542).
- B. Alternate Soil Mix Materials: Engineered soil mixtures utilizing alternate or synthetic materials are acceptable provided the overall composition is completely equivalent to the infiltration performance specifications in paragraph 2.02.A above. Contractor shall submit a request for substitution of materials along with test results for the proposed alternate mix.
- C. Composted Material: Compost shall be a well decomposed, stable, weed-free organic matter source derived from waste materials including yard debris, wood wastes or other organic materials, not including biosolids, meeting the standards developed by the US Composting Council (USCC).
- D. Existing topsoil on the Site may be used as a component of the engineered soil mix. The existing topsoil shall be treated for weeds, tested for pH, organic content, grain size analysis, and permeability to identify necessary amendments. Topsoil shall conform to the requirements of subsection 2.03.
- E. In the event that sufficient topsoil cannot be obtained from on-site excavation, topsoil may be obtained from outside the limits of the Project.

2.03 TOPSOIL

- A. Topsoil, as a component of engineered soil mix, shall be natural, friable, fertile, loam, sandy loam, silt loam, or sandy clay loam per USDA soil triangle. It shall be a uniform native upland topsoil, free from subsoil, objectionable weeds, litter, stiff clay, stones larger than one-inch in diameter, stumps, roots, trash, toxic substances, or any other material which may be harmful to plant growth or hinder planting operations.

B. Composition of topsoil material shall be in accordance with ASTM D5268.

2.04 MULCH

Mulch shall consist of finely shredded (double shredded) hardwood mulch, or equivalent material, and shall be well mixed and homogenous, uniform in color and free of foreign material and viable plant seeds. Mulch shall meet the following criteria:

1. 90% of material passing the 1/2 inch screen.
2. Organic Content: 35% to 65% (dry weight basis).
3. pH: 6.0 to 8.0 (as determined using ASTM D 4972).

2.05 DRAINAGE STONE AND UNDERRDRAIN PIPING

Specified in Section 02681.

2.06 GEOTEXTILE

Specified in Section 02371.

PART 3 EXECUTION

3.01 PREPARATION

- A. Erosion and sediment control measures shall be implemented to protect construction areas. Refer to Section 02125.
- B. Excavate for stormwater quality facilities and construct underdrain system (if required) as specified in Section 02681 and other applicable specification sections.
- C. Prior to placing the underdrain and the engineered soil, the bottom of the excavation (below the bottom of the underdrain and engineered soil mix) shall be roto-tilled or excavated to a minimum depth of 6 inches to alleviate any compaction of the facility bottom. Smooth surface of existing soils. Any ponded water shall be removed from the bottom of the facility and the soil shall be friable before loosening.
- D. Install underdrain, if applicable, as directed in Section 02681.

3.02 GEOTEXTILE INSTALLATION

Specified in Section 02371.

3.03 PLACEMENT OF ENGINEERED SOIL MIX

- A. Engineered soil shall be thoroughly mixed and tested prior to placement.

- B. Place engineered soil mix to the depth and limits required. Installation of engineered soil mix, shall be completed in a manner that will ensure preservation of the infiltrative capacity of the underlying soils. The moisture content of the soil shall be low enough to prevent clumping and compaction during placement.
- C. No heavy equipment shall be used within 10 feet of the limits of stormwater quality facilities before, during, or after placement of the engineered soil mix.
- D. The engineered soil mix shall be placed in horizontal layers not to exceed six inches loose depth, and lightly hand-tamped, wetted, or compacted with a small water-filled landscape roller, to reduce the potential for excessive settling.
- E. Uniformly grade engineered soil mix to achieve a smooth surface, free of irregular surface changes. Do not over-work or excessively compact the soil mix. Grade to cross-sections, thickness and elevations required. Settling of soil by walking on surface and working with hand equipment is acceptable.

3.04 PLACEMENT OF MULCH

- A. Place mulch on top of completed engineered soil mix and around vegetation plantings to a uniform depth of two to four inches. Place to the full limits of each bioretention area as indicated.
- B. Where possible, do not allow mulch to touch plant foliage.

3.05 FIELD QUALITY CONTROL

Test drainage of amended soil by filling stormwater quality facility with water twice in succession. Notify City DWM's representative of water retention exceeding 24 hours.

3.06 MAINTENANCE AND PROTECTION

- A. Remove all debris from within the limits of the constructed stormwater quality facilities.
- B. Protect the constructed areas from erosion and keep free from accumulation of debris. Divert post-construction stormwater runoff around the areas until vegetative cover has been established.
- C. Damage to the constructed areas shall be fully repaired.

+++ END OF SECTION 02922 +++

**SECTION 02933
SEEDING AND SODDING**

PART 1 GENERAL

1.01 SCOPE

- A. The work covered by this Section consists of furnishing all labor, equipment and material required to place topsoil, seed, commercial fertilizer, agricultural limestone and mulch material, including seedbed preparation, harrowing, compacting and other placement operations on graded earthen areas as described herein.
- B. Seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement or sidewalks; all cleared or grubbed areas which are to remain as finish grade surfaces; and on all existing turf areas which are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these Specifications.
- C. The Work shall also include temporary seeding operations to stabilize earthen surfaces during construction or inclement weather and to minimize stream siltation and erosion.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract. In addition, the following information shall be submitted to the City DWM for the Project record:

- 1. Prior to seeding operations, labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the Contractor of any responsibility or liability for furnishing seed meeting the requirements of this Section.
- 2. Prior to topsoil operations, the Contractor shall obtain representative samples and furnish soil test certificates including textural, pH, and organic ignition analysis from the State University Agricultural Extension Services or other certified testing laboratory.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

Wood cellulose fiber mulch shall be manufactured by Weyerhaeuser Company or Conway Corporation.

2.02 MATERIALS AND CONSTRUCTION

A. Topsoil

1. Utilizing stockpiles or borrow areas on site, the Contractor shall place a minimum of 6-inches of topsoil over all graded earthen areas and over any other areas to be seeded.
2. Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.
3. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than 5 percent nor more than 20 percent, by weight, of organic matter as determined by loss on ignition of oven dried samples to 65 Degrees C.

B. Seed

1. Seed shall be hulled common Bermuda (Cynodon Dactylon) guaranteed by the dealer to be 98% minimum purity and 90% minimum germination and certified free of giant strain Bermuda.
2. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U.S. Department of Agriculture Federal Seed Act.
3. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet or otherwise damaged in transit or storage.
4. Seed shall bear the growers analysis testing to 98 percent for purity and 90 percent for germination. At the discretion of the City DWM, samples of seed may be taken for check against the grower's analysis.

5. Species, rate of seeding, fertilization and other requirements are shown in Table 02933-1 at the end of this Section.

C. Fertilizer and Liming Materials

1. Fertilizer and liming materials shall comply with applicable state, local and federal laws concerned with their production and use.
2. Commercial fertilizer shall be a ready mixed material and shall be equivalent to the grade or grades specified in Table 02933-1. Container bags shall have the name and address of the manufacturer, the brand name, net weight and chemical composition.
3. Agricultural limestone shall be a pulverized limestone having a calcium carbonate content of not less than 85 percent by weight.
4. Fertilizer shall be a complete fertilizer, the content of which shall meet the following minimum requirements: 10% nitrogen, 10% phosphoric acid, 10% potash, available materials. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to the site in original unopened containers bearing the manufacturer's statement of guarantee.
5. Ammonium Nitrate shall be a standard brand and shall be delivered to the site in original unopened containers. It shall contain not less than 33-1/3% Nitrogen.

D. Mulch Material

1. All mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.
2. Mulch shall be composed of wood cellulose fiber, straw or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.
3. Straw mulch shall be partially decomposed stalks of wheat, rye, or oats.
4. Stalks shall be the partially decomposed, shredded residue of corn, cane, or sorghum.

E. Mulch Binder

1. Mulch on slopes exceeding 3 to 1 ratio shall be held in place by the use of a mulch binder. The mulch binder shall be non-toxic to plant life.
2. Emulsified asphalt binder shall be Grade SS-1, ASTM D977. Cutback asphalt binder shall be Grade RC 70 or RC 250.

- F. Inoculants for Legumes: All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen fixing bacteria that is adapted to the particular seed involved.
- G. Water: Water shall be clean, clear water free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the Contractor.
- H. Sod
 - 1. Sod shall be living, growing sod of Bermuda hybrids "Tifway 419" or Tifgreen 328". This includes sod which is dormant during the cold or dry season and capable of renewing growth after the dormant period. All sod shall be obtained from qualified, established sources. The presence of weeds or other noxious growth or any other foreign material which may be detrimental to the proposed planting will be cause of rejection. At least 85% of the plants in the sod shall be composed of the designated variety of Bermuda grass.
 - 2. The sod will be subject to inspection by City DWM while it is being planted and any material which has been permitted to dry out excessively or exposed to extreme heat, or which is not viable, will be rejected.
 - 3. In the harvesting of the sod, grass more than 3-inches tall shall be mowed to a height of 3-inches, raked and removed before sod cutting begins. The sod shall be cut into square or rectangular sections which may vary in length, but which shall be of uniform width and thickness, and shall have at least ½-inch of soil adhering firmly to the roots. Care shall be exercised at all times to retain the soil on the roots of the sod during the process of cutting, transporting and planting. Sod shall be transplanted within 24 hours from the time it is harvested. All sod stored shall be kept moist, shall be protected from exposure to the air and sun and from freezing, and shall not be stored for more than 10 days. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected.

PART 3 EXECUTION

3.01 SECURING AND PLACING TOPSOIL

- A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods.
- B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed the product will be homogeneous in nature and will conform to the requirements of these Specifications.

- C. All areas from which topsoil is to be secured, shall be cleaned of all sticks, boards, stones, lime, cement, ashes, cinders, slag, concrete, bitumen or its residue and any other refuse which will hinder or prevent growth.
- D. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if the material cannot be removed the pit shall be abandoned.
- E. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed.
- F. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.02 SEEDBED PREPARATION

- A. Before liming, fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line from unsightly variation, bumps, ridges and depressions and all detrimental material, roots and stones larger than 3-inches in any dimension shall be removed from the soil.
- B. Not earlier than 24 hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than 2-inches with a weighted disc, tiller, pulvimixer or other equipment, until the surface is smooth and in a condition ready to accept seed.
- C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be cultivated for seeding.
- D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition.

3.03 FERTILIZATION AND LIMING

- A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates shown in Table 02933-1 at the end of this Section.
- B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of 1/2-inch.
- C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.

- D. Agricultural limestone shall be thoroughly mixed into the soil according to the rates in Table 02933-1. The specified rate of application of limestone may be reduced if pH tests indicate this to be desirable. It is the responsibility of the Contractor to obtain such tests to determine any adjustment in rates.
- E. It is the responsibility of the Contractor to make one application of a maintenance fertilizer according to the recommendations listed in Table 02933-1.
- F. Spread 20 lbs. per 1,000 sq. ft. of 10-10-10 fertilizer into top 3-inches, hand rake and smooth. The surface shall be brought to finish grade requirements, allowance being made for settlement. Finish grades shall be smooth and free from hollows or other inequalities.
- G. Three weeks after construction of lawns add ammonium nitrate at the rate of 5 lbs. per 1000 sq. ft. of lawn area, and thoroughly water in.

3.04 SEEDING

- A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates shown in Table 02933-1. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.
- B. Seed shall be uniformly sown by mechanical method suitable for the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder or mechanical power drawn seed drills. Hydro-seeding and hydro-mulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.
- C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8-inch by a cultipacker or suitable roller.
- D. Leguminous seeds shall be inoculated prior to seeding with a compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.
- E. Italian rye grass (*Lolium Multiflorum*) shall be evenly seeded with a mechanical spreader at the rate of 5 lbs. per 1000 sq. ft. of area, lightly rake, suitably compact and thoroughly water. Before planting the permanent lawn, the rye shall be thoroughly scarified in a manner to incorporate it into the top three inches of the ground.
- F. The planting of Bermuda grass shall be done only within the season extending from April 15 to August 1.

3.05 MULCHING

- A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied so as to permit some sunlight to penetrate and the air to circulate and at the same time shade the ground, reduce erosion and conserve soil moisture. Approximately 25 percent of the ground shall be visible through the mulch blanket.
- B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:

Wood Cellulose Fiber	1,400 pounds/acre
Straw	4,000 pounds/acre
Stalks	4,000 pounds/acre

- C. These rates may be adjusted at no additional cost to the City DWM, depending on the texture and condition of the mulch material and the characteristics of the seeded area.
- D. The Contractor shall cover structures, poles, fence and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.
- E. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates using standard industry practice.

3.06 WATERING

- A. The Contractor shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain adequate water content in the soil.
- B. Watering shall be accomplished by hoses, tank truck or sprinklers in such a way to prevent erosion, excessive runoff and overwatered spots.

3.07 MAINTENANCE

- A. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris and excess material and the premises shall be left in a neat and orderly condition.
- B. The Contractor shall maintain all seeded areas without additional payment until final acceptance of the work by the City DWM, and any regrading, refertilizing, reliming, reseeding or remulching shall be done at the Contractor's own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is accomplished. Damage resulting from erosion, gulleys, washouts or other causes shall be repaired by

filling with topsoil, compacting and repeating the seeding work at the Contractor's expense.

- C. Contractor's warranty of one (1) year shall also cover a fully rooted stand of grass.

TABLE 02933-1
SEEDING REQUIREMENTS

Area	Sowing Season	Species	Seed	Rates per 1,000 Square Feet		
				Fertilizer	Limestone	Maintenance**
Flat to rolling terrain with slopes less than 3:1	3/1 to 4/15	Rebel II Turf-Type Tall Fescue	6-8 lbs.	30 lbs. 6-12-12	200 lbs.	10 lbs. 10-10-10
	9/1 to 11/15	Rebel II Turf-Type Tall Fescue	6-8 lbs.	30 lbs. 6-12-12	200 lbs.	15 lbs. 10-10-10
Embankments with slopes greater than 3:1	3/1 to 6/1	Crownvetch* Kentucky 31 Fescue	1 lb. 2 lbs.	30 lbs. 6-12-12	200 lbs.	10 lbs. 0-20-20
	8/1 to 11/1	Crownvetch* Kentucky 31 Fescue Annual Ryegrass	1 lb. 2 lb. 2 lb.	30 lbs. 6-12-12	200 lbs.	10 lbs. 0-20-20

* Requires inoculation

** Maintenance fertilizer shall be applied in early spring following initial establishment of cover

+ + + **END OF SECTION 02933** + + +

**SECTION 02934
NATIVE PLUG PLANTING**

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

Section includes furnishing, planting and maintenance of native plug plants for wetlands and other areas. Native being defined as native species which is defined as propagated from or harvested from regionally adapted stock of which these are plant species or genotypes which are native to a range of within 200 miles of the Project site.

- A. Related Work Specified Elsewhere in the Green Infrastructure Specifications:
 - 1. Section 02922 – Amended Soil and Mulch

1.02 REFERENCES

- A. American Nursery and Landscape Association (ANLA): American Standard for Nursery Stock, 2004 Edition
- B. Georgia Storm Water Management Manual, 2016 Edition
- C. U.S. Army Corps of Engineers:
 - 1. *Eastern Mountains and Piedmont, 2014 Regional Wetland Plant List*, Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. *The National Wetland Plant List: 2014 Update of Wetland Ratings*.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract.
- B. Submit the following to the City DWM for the Project record prior to shipment of materials to the Site:
 - 1. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that plants to be furnished meet the requirements specified.
 - 2. Digital photographs of all plants to be furnished.
 - 3. Documentation of qualifications for nursery and installer.
- C. At completion of the Work, submit written Material and Installation Warranty as specified in subsection 1.08.

1.04 QUALITY ASSURANCE

- A. Nursery Qualifications: Herbaceous vegetation shall be procured from nursery source in Georgia. . Nursery source shall be specialist in growing and cultivating native plugs, with three years documented experience.
- B. Installer Qualifications: Company specializing in installing and planting native plugs, with three years documented experience. Up to three references for the installer shall be made provided upon request.
- C. Comply with regulatory agencies for fertilizer and herbicide composition.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Plant plugs shall be delivered and stored in such a way as to be protected from drying winds and direct sunlight. Such protection shall encompass the entire period during which plants are in transit, being handled, or in temporary storage.
- B. Plugs shall be staged in shaded locations and watered as needed to maintain soil in a moist condition.

1.06 PROJECT CONDITIONS

- A. Plantings shall be performed as soon as possible after finish grades are established in each area.
- B. Temperature range and other environmental conditions shall be as appropriate to the vegetation species planted.

1.07 MAINTENANCE

Maintain plants immediately after planting as specified in this Section.

1.08 WARRANTY

Provide a one-year warranty for all Plantings purchased and installed by Contractor. Warranty period shall extend for one full calendar year after Final Completion. Warranty shall include replacement of dead or unhealthy plants within the warranty period in accordance with the requirements of subsections 3.04 and 3.05.

PART 2 – PRODUCTS

2.01 ACCEPTABLE NURSERIES

Nurseries meeting the qualifications listed in subsection 1.04.

2.02 PLANT PLUG REQUIREMENTS

- A. Plantings shall be in accordance of the requirements indicated on the Drawings. All materials shall be true to species. Plants shall conform to the referenced publications for acceptable native species as defined for this Project.
- B. Plant plugs shall be supplied in 38 count flats with cells measuring approximately 2 inches by 2 inches and roots measuring approximately 5 inches deep. Plugs shall have well developed root systems filling the soil but not be overly root bound. Plant tops shall be well developed, healthy, viable, and adequately “hardened off” for outdoor planting.
- C. Plug planting soil shall have been inoculated with mycorrhizal fungi at the nursery at time of seeding. Plugs shall be delivered to the planting site with adequate soil moisture, free of diseases, mold, insect infestations, or other defects.
- D. Plant Materials: Certified by federal or State of Georgia Department of Agriculture; free of disease or hazardous insects.

2.03 SOIL AMENDMENT MATERIALS

- A. Fertilizer (if required) shall be a standard commercial fertilizer, in dry or liquid form, complying with Section 891 of the GDOT Standard Specifications. The grade of fertilizer shall be as determined based on soil test results.
- B. Lime (if required) shall be ground dolomitic limestone designated for agricultural use, meeting the requirements of the Georgia Department of Agriculture and Subsection 882.2.01 of the GDOT Standard Specifications.

2.04 MULCH

Mulch shall be provided in accordance with Section 02922.

PART 3 – EXECUTION

3.01 PREPARATION FOR PLANTING

- A. Complete placement of required engineered soil mix, earthwork grading and other related construction prior to commencement of planting work.
- B. Remove foreign materials, weeds, undesirable plants and their roots, and unsuitable subsoil. Prepare subsoil to eliminate uneven areas. Blend slopes into level areas.
- C. Identify and mark above and below grade utilities including subdrainage pipes to avoid disturbance during planting.
- D. Test drainage of amended soil by filling bed with water twice in succession. Notify City DWM’s representative of water retention exceeding 24 hours.

- E. Excessively dry planting subsoil shall be watered by irrigation, sprinklers, or flooding to moisten soil to a depth of 3 inches prior to planting.

3.02 PLANTING OF PLUGS

- A. Planting of plugs shall be performed during the first optimum planting season following completion of work in an area. Planting dates shall be as required for the location of the Work.
- B. Perform planting at steady rate of work unless weather conditions make it impossible to work. No plant material shall be installed in frozen ground.
- C. Plugs shall be installed in holes drilled by an auger or, where soil is soft and moist enough, made with a dibble bar, stick, or trowel. Holes shall be the same diameter and depth as the plug, with a tolerance of approximately plus or minus 1/2 inch.
- D. Locations and spacing for installation of plugs shall be as required with input from an ecologist. Plant locations may vary depending on soil type, moisture conditions, slope, shading, and other factors for the particular plant species. Groups of five to seven plugs of the same species shall be placed at intervals throughout the planting area, as opposed to planting all species intermixed randomly.
- E. In areas with potential for swift water movement or the action of animals that may dislodge newly planted plugs, all plugs will be secured with 6-inch or 8-inch U-shaped wire erosion control blanket staples. Required staple length shall be determined based on the density of the planting substrate. Softer substrates will require longer length to hold plugs adequately.
- F. In areas where potential for waterfowl depredation exists, such as basins or other areas adjacent to open water, waterfowl barriers shall be installed around a minimum of 50 percent of the plugs. Barriers shall consist of plastic or wire mesh enclosures supported with wooden stakes, adequately constructed to inhibit access by waterfowl for one growing season. Enclosures shall extend at least two feet in height above the plant tops. Barriers shall be removed after one growing season.
- G. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- H. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.03 PLACEMENT OF MULCH

Place mulch around plants as specified in Section 02922.

3.04 MAINTENANCE

- A. Begin maintenance immediately after planting, and continue for a period of one year to establish plants. Maintenance shall include the following:

1. Control aggressive and invasive plant species by means of mowing, hand pulling or herbicide applications as required. Herbicide treatments shall be performed by licensed applicators who are experienced with native and non-native plant identification. Herbicides use shall be in full compliance with all applicable regulations and in strict accordance with label directions. Application techniques shall limit overspray and damage to off-target species.
2. Irrigate plantings as feasible and necessary to achieve one inch of water per week during the first growing season, including natural precipitation.
3. Control water level in wetlands, if practical, to facilitate plant growth and development. Water levels should be maintained at depths of from one inch to ½ the average height of the growing native plants. Water level may be set to normal pool elevation after wetland vegetation has fully matured as determined with input from an ecologist.
4. Maintain waterfowl barriers in wetland plantings and remove barriers after one growing season.

B. Coordinate with City DWM to determine responsibilities and procedures for water supply. Water for plant maintenance shall be obtained and applied by Contractor until Substantial Completion.

3.05 CRITERIA FOR ACCEPTANCE

- A. Final acceptance of planted areas will not be made by the City DWM until a satisfactory stand of plants is evident in all application areas at the end of one full calendar year from the date of Final Completion . A satisfactory stand of plants is defined as living healthy plants and a 90 percent survival rate of all Plantings made.
- B. If the above standards are not met, the Contractor will be responsible for supplemental plantings as approved by the City DWM's representative with input from an ecologist.

+++ END OF SECTION 02934 +++

**SECTION 02949
STORMWATER PLANTERS**

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Section includes fabrication, furnishing and installation of contained landscaped areas designed to receive stormwater runoff from paved surfaces.

- B. Related Work Specified Elsewhere in the Existing COA DWM Specifications:
 - 1. Section 02125 – Temporary and Permanent Erosion and Sedimentation Control
 - 2. Section 02200 – Earthwork
 - 3. Section 02521 – Concrete Sidewalks, Wheelchair Ramps, Curbs and Gutters
 - 4. Section 02900 – Trees, Plants and Ground Covers
 - 5. Division 03 Specifications: For concrete construction

- C. Related Work Specified Elsewhere in the Green Infrastructure Specifications:
 - 1. Section 02371 – Green Infrastructure Geotextiles
 - 2. Section 02681 – Subdrainage for Stormwater Quality Facilities
 - 3. Section 02682 – Pretreatment for Stormwater Quality Facilities
 - 4. Section 02922 – Amended Soil and Mulch
 - 5. Section 02934 – Native Plug Planting

1.02 SYSTEM DESCRIPTION

- A. Stormwater planters shall include the following:
 - 1. Inlets and flow regulating structures.
 - 2. Pretreatment facilities.
 - 3. Cast-in-place or precast concrete walls and curbs.
 - 4. Drainage stone.
 - 5. Underdrain piping (if required).
 - 6. Impermeable liner and upturned overflow pipe in poor soil conditions.
 - 7. Planter bioretention soils (engineered soil mix).
 - 8. Vegetation.
 - 9. Outflow regulating piping.

- B. System shall be located in consideration of the following, at a minimum:
 - 1. Locate in favorable infiltration areas.
 - 2. Locate in areas that drain stormwater runoff primarily from impervious surfaces.

3. Avoid areas with drainage from adjacent erodible areas and a high potential for heavy sediment loads.
4. Place in area(s) not likely to receive runoff from dumpster pads, materials storage or process areas.
5. Avoid possible conflicts with above and below ground utilities (including septic fields and overhead power lines).
6. Locate at least two feet above the seasonally high groundwater level, outside public rights-of-way (unless an appropriate maintenance agreement is completed), and not on steep slopes.
7. Unless the design includes proper waterproofing, planters shall be located: at least five feet from building foundations, buildings with basements, water wells, and public roadway subgrade.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract.
- B. Submit the following to the City DWM for the Project record and prior to shipment of materials to the Site:
 1. Shop Drawings for system components, showing plans, sections and details to include the following:
 - a. Concrete walls and curbs
 - b. Inlet and outflow structures and piping
- C. Submit the following at completion of the Work:

Field Quality Control: Submit test reports and inspection reports (as applicable)

1.04 QUALITY ASSURANCE

Comply with the requirements of governmental authorities having jurisdiction.

1.05 DELIVERY, STORAGE AND HANDLING

- A. All manufactured products shall be inspected upon delivery to the Site. Damaged or defective materials shall be rejected.
- B. Conform to manufacturer's recommendations for handling and storage of products.

- C. Granular materials of different gradations shall be delivered to the Site using clean equipment, and separately stockpiled. Adequately protect to preserve the materials' fitness and quality.

1.06 PROJECT CONDITIONS

- A. The Contractor is solely responsible for excavation slope stability. Excavation work shall be in compliance with applicable local, state and federal regulations (including OSHA).
- B. Work shall be performed in a manner that does not damage or disturb existing utilities, structures, vegetation, and other site features not indicated to be removed.

1.07 SEQUENCING AND SCHEDULING

Coordinate stormwater planter construction with associated work specified in other sections.

PART 2 – PRODUCTS

2.01 PRETREATMENT AND FLOW-REGULATING DEVICES

- A. Pretreatment elements and flow-regulating (energy dissipation) devices shall be provided where possible to filter out sediment, trash, floatables and pollutants from runoff prior to entering stormwater planters.
- B. Pretreatment and energy dissipation shall be as specified in Section 02682.

2.02 INLETS

Inlets shall be provided to direct stormwater into planters, including one or more of the following:

1. Curb cuts or wall openings at edge of planter area
2. Sheet flow off depressed curbs as shown on the standard details
3. Trench drains that convey flows across a sidewalk from curbs or downspouts

2.03 CONCRETE WALLS AND CURBS

- A. Concrete walls and curbs shall be cast-in-place or precast reinforced concrete.

- B. Concrete formwork, reinforcement, concrete materials and mix design for concrete walls and curbs shall conform to the applicable requirements of Division 03 Specifications and Section 02521. Unless otherwise specified, minimum compressive strength of concrete shall be 3,000 psi.

2.04 IMPERMEABLE LINER

Impermeable liner to be installed on side or bottom of planters (when required) shall be a 30-mil minimum thickness geomembrane fabricated of linear low density polyethylene (LLDPE), high density polyethylene (HDPE), flexible polypropylene, or polyvinyl chloride (PVC).

2.05 CHOKER COURSE AND DRAINAGE STONE

Choker course material and drainage stone shall conform to the material specifications in Section 02681.

2.06 GEOTEXTILE

Specified in Section 02371.

2.07 UNDERDRAIN PIPING

Underdrain piping (if required) shall conform to the material specifications in Section 02681.

2.08 ENGINEERED SOIL MIX AND MULCH

Engineered soil mix and mulch layers for planters shall conform to the material specifications in Section 02922.

2.09 OUTFLOW REGULATING DEVICES

- A. Outflow regulating devices shall include non-perforated outlet piping and structures per City DWM standards.
- B. Non-perforated outlet piping shall conform to the material specifications in Section 02681.

2.10 VEGETATION

Furnish , shrubs, and herbaceous vegetation where required and as indicated on Drawings specified in Sections 02900 and 02934.

PART 3 EXECUTION

3.01 PREPARATION

- A. Establish required dimensions and elevations for stormwater planter construction.
- B. Erosion and sediment control measures shall be implemented to protect construction areas. Conform to the permit requirements and as specified in Section 02125.

3.02 EARTHWORK

- A. Excavate in accordance with the applicable requirements of Section 02200 as modified in this Section. Excavate to the required dimensions and depths.
- B. Bottom of the excavation shall be uniformly graded to a level surface within each designated planter area.
- C. Excavated materials shall be removed from the construction areas and placed in other locations on the site, if needed, or off-site.
- D. Protect the prepared bottom of excavation from compaction during construction. If required, the bottom of the excavation shall be scarified (by raking, disking or tilling) to a minimum depth of six inches.

3.03 CONCRETE WALLS AND CURBS

- A. Construct concrete walls and curbs at the required alignment and dimensions.
- B. Conform to the applicable requirements of Division 3 Specifications for construction of concrete walls.
- C. Conform to the applicable requirements of Section 02521 for construction of concrete curbs.
- D. Inlet openings shall be provided to the required dimensions.

3.04 IMPERMEABLE LINER INSTALLATION

- A. Where required, install impermeable liner over exposed sides or bottom of excavation within the limits of planters. The surface on which impermeable liner is to be placed shall be relatively smooth and uniform, and substantially free of protruding stones and other debris.
- B. Impermeable liner shall be continuous to the full dimensions of the planters as much as practicable. If more than one roll or panel is required, overlap adjacent rolls or

panels a minimum of 12 inches and seaming will be required in accordance with the manufacturer's recommendations.

3.05 PLACEMENT OF DRAINAGE BED AND UNDERDRAIN PIPING

- A. Install geotextile (if required) as specified in Section 02371.
- B. Place drainage stone and choker course material to the required depths and sequences and as specified in Section 02681.
- C. Install underdrain pipe (if required), including cleanouts, at the required locations and as specified in Section 02681.

3.06 PLACEMENT OF ENGINEERED SOIL MIX AND MULCH

- A. Place engineered soil mix and mulch to the required depth and limits and as specified in Section 02922.
- B. For open bottom planters, installation of soils must be completed in a manner that will ensure preservation of the infiltrative capacity of the underlying soils. The moisture content of the soil shall be low enough to prevent clumping and compaction during placement.

3.07 VEGETATION PLANTING

- A. If placement of engineered soil mix coincides with preferred dates for planting, install plants immediately after completion of the soil mix. Otherwise, place mulch or other industry-standard stabilization material and maintain until planting is completed.
- B. Plant , shrubs, and herbaceous vegetation where required and as indicated on Drawings and as specified in Sections 02900 and 02934 (as applicable).

3.08 MAINTENANCE AND PROTECTION

- A. Prior to the City DWM's final acceptance of the Work, Contractor shall perform maintenance and protection of the construction as specified in this Section. In addition, for the one year warranty period, Contractor shall correct or remove and replace defective work as approved by the City DWM's representative in accordance with the terms of the Contract.
- B. Remove all debris from within the limits of the constructed stormwater planters.
- C. Protect the constructed areas from erosion and keep free from accumulation of debris. Divert post-construction stormwater runoff around the areas until vegetative cover has been established.

- D. Damage to the constructed areas shall be fully repaired to meet Contract requirements.

+++ END OF SECTION 02949 +++

**SECTION 03100
CONCRETE FORMWORK**

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install concrete formwork as required by the concrete outlines for all cast-in-place concrete, complete. The use of stay in place forms is expressly prohibited.
- B. Notify other contractors in advance of the trades of the formwork to provide the other trades with sufficient time for the installation of items included in their contracts that must be installed with the formwork.
- C. Form Design:
 - 1. Formwork shall comply with ANSI A10.9 and OSHA Construction Standards, Part 1926, Subpart Q, Concrete, Concrete Forms, and Shoring.
 - 2. The form designs shall meet the requirements of ACI 347.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents.
- B. Submit to the City DWM for the Project record copies of manufacturer's data and installation instructions for proprietary materials, including form coatings and releasing agents, manufactured form systems, ties and accessories.
- C. Do not provide submittals for the structural design of forms.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with applicable provisions and recommendations of the latest editions of the following standards:
 - 1. ACI 301 - Specification for Structural Concrete
 - 2. ACI 347 - Guide to Formwork for Concrete
- B. Allowable Tolerances:
 - 1. Construct formwork to provide completed concrete surfaces complying with tolerances specified in ACI 347.

2. Maximum acceptable deflection is 1/8-inch in 5-feet 0-inches on all flat surfaces (ACI 347 Class A Finish).
- C. Notify the City DWM a minimum of 48 hours before closure of forms that would prevent subsequent inspection by the City DWM.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. On delivery to jobsite, place materials in area protected from weather.
- B. Store materials above ground on framework or blocking. Cover wood for forms with protective waterproof covering. Provide for adequate air circulation or ventilation.
- C. Handle materials to prevent damage.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete (Smooth Finish):
 1. Unless otherwise shown or specified, construct formwork for concrete surfaces exposed to view in the finished structure, with plywood, metal, metal-framed plywood-faced or other panel type materials to provide continuous, straight, smooth as-cast surfaces.
 2. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown or specified. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete (Rough Finish):
 1. Form concrete surfaces that will be unexposed in the finished structure with plywood, lumber, metal, or other acceptable material.
 2. Provide lumber that is dressed on at least 2 edges and 1 side.
- C. Form Ties:
 1. Provide factory-fabricated, removable or snap off metal form ties designed to prevent form deflection and to prevent spalling of concrete surfaces upon removal. Contractor shall approve materials used for tying forms.

2. Unless otherwise shown, provide ties so that portion remaining within concrete after removal of exterior parts is at least 1 inch from the outer concrete surface. Unless otherwise shown, provide form ties that will leave a hole no larger than 1-inch diameter in the concrete surface.
 3. Ties for exterior walls and walls subject to hydrostatic pressure shall have waterstops that are integral with the tie, preferably a solid washer at mid-point of the tie.
 4. Provide wood or plastic cones for ties, where concrete is exposed in the finished structure.
- D. Form Coatings: Provide commercial formulation form coating compounds that will not bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

PART 3 EXECUTION

3.01 DESIGN OF FORMWORK

- A. Formwork shall be in accordance with ACI 347 and as follows:
1. Design, erect, support, brace and maintain formwork so that it shall safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by formwork system or in-place construction that has attained adequate strength for this purpose. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
 2. Design forms and false work to include make full allowance for all of live loads, dead loads, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
 3. Forms shall conform to shape, lines and dimensions of members indicated and shall be rigid and tight to prevent leakage of mortar. Forms shall be braced or tied together so as to maintain position and shape. Construct forms so that they can be removed readily without hammering or prying against the concrete. Forms shall be carefully made and accurately placed to obtain correct shape and lines.
 4. Joints shall be butted tight. Arrangements of panels shall be orderly and symmetrical, and use of small pieces shall be avoided. Forms shall be chamfered 1-inch for external corners of concrete, including tops of walls, which will be exposed to view in the finished work.

5. Provide adequate formwork in its entirety. Forms shall safely support loads they will sustain and shall maintain their dimensional and surface correctness to produce members required. Form ties shall be spaced close enough to avoid bulges and variations in the required cross-sectional dimensions for the members being cast.
6. Box out for chases, recesses or other openings required in the completed work.
7. Install all the items (sleeves, inserts, hangers, anchors, etc.) to be supported by the formwork as required by the work.
8. Install pipe sleeves, wall pipes and wall sleeves, as shown or specified, for all piping penetrating walls and slabs. The use of block-outs in walls is prohibited.
9. Provide a sufficient number of cleanout doors at the base of walls and columns to facilitate cleaning and the application of grout to the base of walls.
10. The use of reinforcing steel, partially embedded in concrete, as toe pins or form spacers is prohibited.

B. Forms for Exposed Concrete

1. Do not use metal cover plates for patching holes or defects in forms.
2. Provide sharp, clean corners at intersecting planes, without visible edges of offsets. Back joints with extra beams or girts to maintain true, square intersections.
3. Use extra beams, walers, and bracing to prevent bowing of forms between beams and to avoid bowed appearance in concrete. Do not use narrow strips of form material that will produce bow.
4. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.
5. Form molding shapes, recessed and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.
6. Chamfer exposed corners and edges.

C. Corner Treatment

1. Form exposed corners of beams, walls, bases and columns to produce smooth, solid, unbroken lines, except as otherwise shown. Except as specified below for re-entrant or internal corners, exposed corners shall be chamfered.

2. Form chamfers with $\frac{3}{4}$ by $\frac{3}{4}$ strips, unless otherwise shown, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer strips at changes in direction.
 3. Re-entrant or internal corners and unexposed corners may be formed square.
- D. Joints: Refer to Section 03250 for treatment of joints.
- E. Cleaning and Tightening
1. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is to be placed.
 2. Re-tighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.02 FORM COATINGS

- A. Coat form contact surfaces with a non-staining no petroleum form coating compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces, which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.
- B. Volatile organic compound emissions of form releasing agents shall not exceed 2.09 pounds per gallon or that as acceptable in the State, County or District of their intended use, whichever is more stringent.
- C. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork shall not be acceptable.
- D. Form releasing agents shall not impair subsequent treatment of concrete surfaces that depend upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

3.03 INSTALLATION OF EMBEDDED ITEMS

- A. General:
 1. Set and build into the formwork, anchorage devices and other embedded items, shown specified or required by other Sections. Refer to paragraph 1.01 B herein for the requirements of coordination. Use necessary setting drawings, diagrams, instructions and directions.
 2. All embeds should be supported, plumbed and carefully taped or covered to prohibit the infiltration of concrete during the pour.

3. Coat any aluminum or reactive metal inserts with non-reactive coating to isolate the metal surfaces.
- B. Edge Forms and Screed Strips for Slabs and Sidewalks:
1. Set edge forms or bulkheads and intermediate screed strips for slabs and sidewalks to obtain required elevations and contours in the finished slab surface. Provide and secure units to support screeds.
 2. The screeds may not be tack welded to the rebar embeds, or structural steel.

3.04 FIELD QUALITY CONTROL

- A. Before concrete placement, the Contractor shall inspect all formwork. No concrete shall be poured without the Contractor's approval.
- B. Before concrete placement, the Contractor shall check the formwork, including lines, ties, tie cones, and form coatings. The Contractor shall make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.
- C. During concrete placement, the Contractor shall check formwork and related supports to ensure that forms are not displaced and that completed Work shall be within specified tolerances.
- D. If the Contractor finds that forms are unsatisfactory in any way, either before or during placing of concrete, placement of concrete shall be postponed or stopped until the defects have been corrected.

3.05 REMOVAL OF FORMS

- A. Remove forms and false work in a manner that will prevent damage to the concrete and not impair the safety of the structure.
- B. Do not use pinch bars or similar tools to pry against concrete surfaces.
- C. Do not remove forms until concrete has aged as follows:
 1. Elevated slabs and beams: 7 days minimum.
 2. Grade beams, columns, walls, construction and expansion joint bulkheads and other vertical surfaces: 24 hours minimum.
- D. Elevated slabs and beams shall have attained at least 70 percent of the specified 28 day strength before form removal. Concrete shall also have sufficient strength to safely support its own weight and construction loads. Determine concrete strength for form

removal in conformance with ACI 301.

- E. Reshore elevated concrete elements immediately upon form removal. Shoring shall remain in place until the concrete has attained the specified 28 day design strength.
- F. Maintain shoring of elevated concrete elements which support subsequent construction when the subsequent construction loads exceed the design live load of the elements

3.06 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be re-used in the Work. Split, frayed, delaminated or otherwise damaged form facing material shall not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.
 - 1. Plywood surfaced forms must have smooth clean faces for re-use, and may not have excessive knots or tie hole plugs. Forms shall not be used more than (3) times.
 - 2. Metal surfaced forms shall have a smooth even surface without plate patches.

+++ END OF SECTION 03100 +++

SECTION 03200
CONCRETE REINFORCEMENT AND DOWELING

PART 1 GENERAL

1.01 SCOPE

- A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide concrete reinforcement and doweling as shown and specified.
- B. The extent of concrete reinforcement and doweling shall be as required for compliance with industry standards and codes.
- C. The Work includes fabrication and placement of reinforcement including bars, ties and supports for concrete and encasements.

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract Documents. In addition, the following specific information shall be provided:

- 1. Shop Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315, Chapters 1 thru 8. Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for the fabrications and placement of concrete reinforcement unless otherwise noted. Splices shall be kept to a minimum. Show construction joints.
- 2. Copies of manufacturer's specifications and installation instructions for all materials and reinforcement accessories.
- 3. Copies of steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel.

1.03 QUALITY ASSURANCE

- A. The Contractor shall examine the substrate and the conditions under which concrete reinforcement is to be placed. Do not proceed with the work until unsatisfactory conditions have been corrected in accordance with applicable codes and standards.
- B. Reference Standards: The Contractor shall comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below.
 - 1. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

2. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 3. ACI 318 - Building Code Requirements for Structural Concrete.
 4. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures.
 5. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 6. AWS D.1 - Structural Welding Code.
- C. Minimum Concrete Cover for Reinforcement: Comply with ACI 350.
- D. Splices other than lap splices shall not be used.
- E. Reinforcement which arrives on the jobsite which is not tagged as specified in Paragraph 1.04A of this Section shall be rejected by the Contractor and removed at the Contractor's expense.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver concrete reinforcement materials to the site bundled, tagged and marked. Use metal tags indicating bar size, length, and other information corresponding to markings shown on placement diagrams.
- B. Store concrete reinforcement material at the site to prevent damage and accumulation of dirt or excessive rust. Store on heavy wood blocking so that no part of it will come in contact with the ground.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars and Dowels:
1. Reinforcing bars and dowels shall conform to ASTM A615, Grade 60, where welding of reinforcing bars is not required.
 2. Reinforcing bars and dowels shall conform to ASTM A706, Grade 60, where welding of reinforcing bars is required.
- B. Welded Wire Reinforcement:

1. Welded wire reinforcement shall conform to ASTM A185. Wire shall conform to ASTM A82.
 2. Welded wire reinforcement shall be furnished in flat sheets, not rolls.
- B. Supports for Reinforcement:
1. Bar supports coming into contact with forms shall be CRSI Class 1 plastic protected or Class 2 stainless steel protected and shall be located in accordance with CRSI MSP-1 and placed in accordance with CRSI PRB.
 2. Precast concrete block supports shall be provided for reinforcing in concrete cast against grade.
- D. Mechanical Connections
1. Metal Sleeve: Steel sleeve with cast filler metal, capable of developing, under tension or compression, 125 percent of specified yield strength of the reinforcing bar. Metal sleeve shall be as manufactured by:
 - a. Erico Products, Inc., Cleveland, OH.
 - b. Or equal.
 2. Mechanical Threaded Connection: Metal coupling sleeve with internal threads which engage threaded ends of bars to be spliced, and develops under tension or compression, 125 percent of the specified yield strength of the bar. Mechanical threaded connection shall be as manufactured by:
 - a. Erico Products, Inc., Cleveland, OH, Lenton Reinforcing Steel Couplers.
 - b. Richmond Screw Anchor Co., Inc., Fort Worth, TX, Richmond DB-SAE Dowel Bar Splicers.
 - c. Or equal.
- E. High Strength Bars: High strength bars shall be 150 KSI steel conforming to ASTM A722, threaded full length. Anchor nuts shall be manufacturer's standard designed for use with bars. Mechanical couplers, when required, shall be capable of developing 100 percent of guaranteed ultimate strength of the bars.

2.02 FABRICATION

- A. General: Fabricate reinforcing bars and dowelling to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice" and ACI minimums. In case of fabricating errors, do not re-bend, retemper, heat, deform or straighten reinforcement.

B. Unacceptable Materials: Reinforcement with any of the defects listed below will not be permitted in the Work:

1. Bar lengths, bends and other dimensions exceeding specified fabrication tolerances.
2. Bends or kinks not shown on Shop Drawings.
3. Bars with reduced cross-section due to excessive rusting or other cause.
4. Surface contamination that would affect the bond (i.e. grease, dirt, paint, rust etc.)
5. Heat deformed or torched bars.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Comply with the applicable recommendations of specified codes and standards, and CRSI "Placing Reinforcing Bars" and ACI requirements for details and methods of reinforcement placement and supports.
- B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other injurious materials which reduce or destroy bond with concrete.
- C. Position, support, and secure reinforcement and dowelling against displacement during formwork construction or concrete placement and grouting operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required. Wood blocks shall not be allowed for rebar support.
 1. Place reinforcement to obtain the minimum concrete coverages as shown and as specified in ACI 350. Arrange, space, and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 2. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.
- D. Install welded wire fabric in as long lengths as practical. Lap adjoining pieces at least one full mesh and lace splices with 16 gauge wire and tie.

- E. Provide sufficient numbers of supports of strength required to carry reinforcement without sagging. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- F. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars.
- G. Dowels shall be embedded a minimum of 8 inches into existing concrete. Grout with an industry-accepted epoxy grout.
- H. Existing concrete which is shown to remain but is removed in error or must be removed to install new Work is to be reinforced to the extent as required in accordance with applicable code.
- I. Do not straighten or rebend reinforcing.
- J. Reinforcement around Openings: Place an equivalent area of steel around the pipe or openings and extend on each side sufficiently to develop bond in each bar. Where welded wire fabric is used, provide extra reinforcing using fabric or deformed bars.
- K. Welded Reinforcement
 - 1. Welding shall not be permitted unless the Contractor submits detailed shop drawings, qualifications, and radiographic nondestructive testing procedures for such Work.
 - 2. Reinforcing bars to be welded shall conform to ASTM A706. Other bars shall not be welded.
 - 3. The basis for the Contractor submittals shall be The Structural Welding Code, Reinforcing Steel, AWS D1.4-79, published by the American Welding Society and the applicable portions of ACI 318. The Contractor shall test 10 percent of all welds using radiographic, nondestructive testing procedures referenced in this code.

3.02 INSPECTION OF REINFORCEMENT

- A. After the rebar, appliance, anchors, and embedments have been installed and checked, the Contractor shall review all aspects of the pending concrete pour and initial those items on its pour card. Contractor shall notify the City DWM no less than 24 hours prior to the pour, so that the City DWM may inspect the reinforcement, if desired.

- B. Concrete shall not be placed until the reinforcing steel is inspected and permission for placing concrete is granted by the Contractor. All concrete placed in violation of this provision will be rejected. Rejected concrete shall be removed and replaced at no cost to the City DWM.

+++ END OF SECTION 03200 +++

**SECTION 03250
CONCRETE JOINTS**

PART 1 GENERAL

1.01 SCOPE

- A. Contractor shall furnish all labor, materials, equipment and incidentals required to provide concrete joints as shown and specified.
- B. The types of concrete joints required include the following:
 - 1. Construction joints.
 - 2. Expansion joints and fillers.
 - 3. Waterstops.
- C. General: All joints subject to hydrostatic pressure shall be provided with a continuous waterstop.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents. In addition, the following specific information shall be provided to the City DWM for the Project record:
 - 1. Product data for all materials stating the location where product is to be used.
 - 2. Certification that materials meet the specifications.
 - 3. Manufacturer's application and installation instructions.
 - 4. Samples of water stops, concrete roughener, joint fillers, caulk and bonding agent if requested by the City DWM.

1.03 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following:
 - 1. ACI 301 - Specifications for Structural Concrete for Buildings, Chapter 6, Joints and Embedded Items.
 - 2. ACI 350 - Environmental Engineering Concrete Structures, Chapter 2.8, Joints.

3. ASTM D1752 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- B. All manufactured items shall be installed in accordance with manufacturer's instructions.
- C. Construction and expansion joints shall not be added or relocated without the Approval of the Contractor.

PART 2 PRODUCTS

2.01 JOINT SEALER

- A. Materials shall be two component, polyurethane meeting ASTM C920 and FED SPEC TT-S-00227E specifications. Materials shall have \pm 50 percent movement.
- B. Manufacturer and product shall be:
1. Horizontal Joint - Sikaflex 2C Self Leveling by Sika Corp or equal.
 2. Vertical Joint - Sikaflex 2C Non-Sag by Sika Corp or equal.

2.02 CONSTRUCTION JOINTS

- A. Bonding agent shall conform to requirements of ASTM C881 with a bond strength of 1500 psi minimum. Bonding agent shall be capable of spraying in inaccessible locations, if necessary.
- B. Manufacturer and product shall be:
1. Sika Armatic 110 by Sika Corp.
 2. Sikadur 32 Hi-Mod by Sika Corp.
 3. Or equal.

2.03 JOINT FILLER

Expansion Joint Material: Type I, preformed sponge neoprene expansion joint filler conforming to AASHTO Designation M-153.

2.04 WATERSTOPS

Waterstop shall be PVC (polyvinylchloride) meeting ASTM D638 test method for tensile strength of 2020 psi and ultimate elongation of 370.

1. Construction Joints:
 - a. Serrated with center bulb, 3/8-inch thick by 6-inches minimum width, Greenstreak #706 or equal.
 - b. Preformed plastic adhesive waterstop, Synko-Flex Products or approved equal.
2. Expansion Joints: Serrated with center bulb, 3/8-inch thick by 9-inch minimum width, Greenstreak #738 or equal.

PART 3 EXECUTION

3.01 CONSTRUCTION JOINTS

A. General:

1. Comply with ACI 301, Chapter 6, and ACI 350, Chapter 2.8.3 and as specified below.
2. Provide waterstops in construction joints.
3. All joints between new and existing concrete shall comply with Paragraph 3.01 of this Section.

B. Installation:

1. Brush blast new and existing concrete surfaces at joint and surrounding area. Dry, oil-free air shall be used for blasting operation. Blasting shall be sufficient to remove laitance and solid contaminants, open up surface voids, bug holes, air pockets and other subsurface irregularities but not expose underlying aggregate. The abrasive shall be dry and clean and will pass through a 16 mesh screen. After blast cleaning is completed, residual abrasive dust and loose particles shall be removed from the surface by vacuuming or by compressed air. Blasting operation shall be repeated if required to achieve proper finish in accordance with industry and City DWM standards.
2. Install waterstop and bonding agent per manufacturer recommendations and this Section. Spray on epoxy bonding agent in inaccessible areas in accordance with the manufacturer's recommendations.
3. Place a 6-inch grout charge of similar proportions to the cement in the concrete, over the damp, clean horizontal contact surface of the old concrete. Place fresh concrete before the grout has attained its initial set. Grout shall be cement-sand grout as specified in Section 03600.

4. When concrete has been placed and the form removed, wash loosened material off with high pressure water spray to obtain roughened surface prior to rub finish.
5. Cure concrete sufficiently prior to placement of joint filler and epoxy coating to obtain optimum bond as per manufacturer's recommendations.
6. Install appliances in conformance with industry and City DWM standards.

3.02 WATERSTOPS

A. General:

1. Comply with ACI 301, Chapter 6, Paragraph 3.01 B of this Section and as specified below. All joints shall be made in accordance with manufacturer's instructions.
2. Install at required locations.

B. Polyvinyl Chloride Waterstop:

1. Tie waterstop to reinforcement so that it is securely and rigidly supported in the proper position during concrete placement to insure their proper positioning. Puncturing waterstop with tire wire to secure it to reinforcement is prohibited.
2. Waterstops shall be fused using equipment as supplied by or recommended by the manufacturer. Heat weld at all splice points.
3. Provide sufficient bed of epoxy grout, after sandblasting, cleaning roughening and priming the surface, so as to fill all voids including the "V" at the split.
4. Install split-bulb PVC waterstop onto the non-shrink, non-metallic grout bed. Mount waterstop to wall using two (2) ¼-inch x 2-inch type 316 stainless steel strips on either side of the waterstop anchored with ½-inch diameter type 316 stainless steel anchor bolts on 12-inch centers.
5. Fill all voids between the waterstop and the concrete with epoxy grout. Injection method may be used at Contractor's option.
6. Obtain City DWM's approval of the waterstop installation prior to placing concrete.

+++ END OF SECTION 03250 +++

**SECTION 03300
CAST-IN-PLACE CONCRETE**

PART 1 GENERAL

1.01 SCOPE

A. General

1. Contractor shall furnish all labor, materials, equipment and incidentals needed to provide form work, reinforcement, concrete including all concrete joints, grout and incidentals required to complete the Work as shown and specified.
2. The Work includes providing concrete consisting of Portland cement, fine and coarse aggregate, water and admixtures combined, mixed, transported, placed, finished and cured. The Work also includes:
 - a. Providing openings in concrete to accommodate the Work under this and other Sections and building into the concrete all items such as sleeves, frames, anchor bolts, inserts and all other items to be embedded.
 - b. Providing openings in concrete to accommodate the work under other contracts and building into the concrete all items such as sleeves, frames, anchor bolts, inserts and all other items required to be embedded under other contracts.

B. Coordination:

1. Review installation procedures under other Sections and coordinate the installation of items that must be installed in the concrete as a prime responsibility of the Contractor.
2. Notify other Contractors in advance of the placing of concrete to provide the other contractors with sufficient time for furnishing of items included in their contracts that must be installed in the concrete.
3. Required City DWM formal pour card with all required signatures.

C. Classes of Concrete:

1. Class "A" concrete shall attain 4,000 psi compressive strength at 28 days, shall be steel reinforced and includes the following:
 - a. Foundations.
 - b. Walls.
 - c. Slabs on grade.

- d. Beams.
 - e. Elevated concrete floors.
 - f. Columns.
2. Class "B" concrete shall attain 3,000 psi compressive strength at 28 days, shall be placed without forms or with simple forms, with little or no reinforcing and includes the following:
- a. Sidewalks.
 - b. Curbs.
 - c. Pavement patches.
 - d. Thrust blocking.
 - e. Fence post footings.
 - f. Mud Slabs.
 - g. Fill concrete.
3. Class "C" concrete shall attain 1,500 psi compressive strength at 28 days, shall be placed without forms or with simple forms, with little or no reinforcing and includes the following:
- a. Concrete encasement for pipe.
- b. Other locations as required.
4. 25% to 35% of Type F or N Fly ash shall be used as an alternate to Portland Cement.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract Documents.
- B. Samples: Submit samples of materials as specified and as otherwise may be requested by the City DWM, including names, sources and descriptions.
- C. Shop Drawings: Submit to the City DWM for the Project record the following:
 - 1. List of concrete materials and concrete mix designs proposed for use. Include the results of all tests performed to qualify the materials and to establish the mix designs.
 - 2. Copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
 - 3. Copies of the manufacturer's sourcing location. (Note: Sourcing is required from within 100 miles of the Site).

- D. Laboratory Test Reports: Submit copies of laboratory test reports for concrete cylinders, materials and mix design tests for the Project record. Production of concrete to comply with specified requirements is the responsibility of the Contractor. Submit the testing laboratory's average strength curve from the design mix proportions of the proposed materials.
- E. Submit notarized certification of conformance to referenced standards to the City DWM and a copy of the batch plant's most recent scale calibration.
- F. Delivery Tickets: Furnish to Contractor and if requested by City DWM copies of all delivery tickets for each load of concrete delivered to the site. Provide items of information as specified in ASTM C94, Section 14.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ACI 301 - Specification for Structural Concrete (includes ASTM Standards referred to herein).
 - 2. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - 3. ACI 305 - Hot Weather Concreting.
 - 4. ACI 306 - Cold Weather Concreting.
 - 5. ACI 308 - Standard Practice for Curing Concrete.
 - 6. ACI 309 - Recommended Practice for Consolidation of Concrete.
 - 7. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - 8. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures
 - 9. ACI 347 - Recommended Practice for Concrete Formwork.
 - 10. ASTM C31 - Standard Method of Making and Curing Concrete Test Specimens in the Field.
 - 11. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 12. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

13. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
14. ASTM C42 - Standard Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
15. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
16. ASTM C138 - Standard Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.
17. ASTM C143 - Standard Test Method for Slump of Portland cement Concrete.
18. ASTM C150 - Standard Specification for Portland cement.
19. ASTM C157 - Standard Test Method for Length Change of Hardened Cement Mortar and Concrete.
20. ASTM C171 - Standard Specification for Sheet Materials for Curing Compounds.
21. ASTM C172 - Standard Method of Sampling Freshly Mixed Concrete.
22. ASTM C173 - Standard Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
23. ASTM C192 - Standard Method of Making and Curing Concrete Test Specimens in the Laboratory.
24. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
25. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
26. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
27. ASTM C827 - Standard Test Method for Early Volume Change of Cementitious Mixtures.
28. Federal Specification CCC-C-467C: Cloth, Burlap Jute or Kenaf.

B. Concrete Testing Service:

1. Contractor shall employ, at its own expense, a testing laboratory experienced in design and testing of concrete materials and mixes to perform material evaluation tests and to design concrete mixes.
 - a. Testing agency shall meet the requirements of ASTM E329.

- b. Submit a written description of the proposed concrete testing laboratory giving qualifications of personnel, laboratory facilities and equipment, and other information which may be requested by the City DWM.
 - c. Submit certification that the testing facility meets the requirements of ASTM E329.
 2. Materials and installed Work may require testing and retesting as directed by the Contractor at any time during the progress of the Work. Contractor shall allow free access to material stockpiles and facilities at all times. Testing and retesting of rejected materials and installed Work, shall be done at the Contractor's expense.
 3. Testing for concrete field quality control as specified under Paragraph 3.07 of this Specification, shall also be performed by the Contractor's testing laboratory.
- C. Qualifications of Water-Reducing Admixture Manufacturer:
 1. Water-reducing admixtures shall be manufactured under strict quality control in facilities operated under a quality assurance program. Contractor shall furnish copy of manufacturer's quality assurance handbook to document the existence of the program. Manufacturer shall maintain a concrete testing laboratory which has been approved by the Cement and Concrete Reference Laboratory at the Bureau of Standards, Washington, D.C.
 2. Provide a qualified concrete technician employed by the admixture manufacturer to assist in proportioning the concrete for optimum use of the admixture. The concrete technician, when requested, shall advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job site conditions.
 3. Contractor to submit manufacturer source and ensure that the distance limit for sourcing is no more than 100 miles.
- D. Test for Concrete Materials:
 1. Submit written reports to the City DWM, for each material selected and tested, prior to the start of Work. Provide the Project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer and brand name for manufactured materials, values specified in the referenced specification for each materials, and test results. Indicate acceptability of materials for intended use.
 2. Have the testing laboratory run a sample load of the design mix and make a minimum of 12 test cylinders. Then have the laboratory do cylinder breaks at 3, 7, 21 and 28 days and plot an average strength curve for the mix design. Submit curve to the City DWM prior to any concrete pour.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to insure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement:

1. Portland cement, ASTM C150, Type II.
2. Use Portland cement made by a qualified, acceptable manufacturer and produced by not more than one plant.
3. Do not use cement which has deteriorated because of improper storage or handling.
4. Type I cement is NOT PERMITTED.
5. 25% to 35% Type F or N Fly ash shall be used as an alternate to Portland Cement.

B. Aggregates: ASTM C33 and as herein specified.

1. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces. Slag materials are not allowed.
2. Fine Aggregate: Fine aggregate shall be clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.
3. Coarse Aggregate: Coarse aggregate shall be clean granitic, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter as follows:
 - a. Crushed stone, processed from natural rock or stone.
 - b. Coarse Aggregate Size: Size to be ASTM C33, Nos. 57 or 67, except that No. 467 may be used for footings, foundation mats and walls 16 inches or greater in thickness.
4. Sourcing is required from within 50 miles of the Site and source shall be documented.

- C. Water: Water shall be clean, free from injurious amounts of oils, acids, alkalis, organic materials or other substances that may be deleterious to concrete or steel.
- D. Distance limit for aggregate shall be no greater than 50 miles for sourcing.

2.02 CONCRETE ADMIXTURES

- A. Provide admixtures produced by established reputable manufacturers, and use in compliance with the manufacturer's printed instructions. Do not use admixtures, which have not been incorporated and tested in the accepted mixes.
- B. Air-Entraining Admixtures: ASTM C260.
 - 1. Product and Manufacturer: Provide one of the following:
 - a. Daravair as manufactured by Grace Construction Products.
 - b. MB-VR as manufactured by Master Builders Company.
 - c. Sika AER as manufactured by Sika Chemical Corporation.
 - d. Air Entraining Agent as manufactured by W. R. Meadows.
 - e. Or equal.
 - 2. Air entrainment shall be required for all concrete used on this project.
- C. Water-Reducing Admixture: ASTM C494, Type A.
 - 1. Proportion all concrete with non-air entraining, normal setting, water-reducing, aqueous solution of a modification of the salt of polyhydroxylated organic acids. The admixture shall not contain more chloride ions than are contained in municipal drinking water. Provide one of the following:
 - a. WRDA-86 as manufactured by Grace Construction Products.
 - b. Pozzoloth by Master Builders Company.
 - c. Plastocrete 161 as manufactured by Sika Chemical corporation
 - d. Or equal.
 - 2. Water-reducing admixture shall be required for all type A and B concrete.
- D. Calcium Chloride: Do not use calcium chloride in concrete.
- E. Do not use a retarder in the concrete.

2.03 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes of concrete. Use the same design mix for both classes of concrete. Mixes subject to the following limitations:

1. Specified 28 day Compressive Strength:
 - a. Class A - 4,000 psi.
 - b. Class B - 3,000 psi.
2. Maximum Water-Cement Ratio by Weight: .45.

Coarse Aggregate Number	Minimum Cement Content, Pounds Per Cubic Yard	Percent Air Content
57,67	564	6 ± 1%
467	517	5 1/2 ± 1%

- B. Use an independent testing facility for preparing and reporting proposed mix designs.
 1. The testing facility shall not be the same as used for field quality control testing.
 2. Calibration charts on the lab equipment must be submitted.
- C. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for concrete required. Comply with ACI 211.1 and report to the City DWM the following data:
 1. Complete identification of aggregate source of supply.
 2. Tests of aggregates for compliance with specified requirements.
 3. Scale weight of each aggregate.
 4. Absorbed water in each aggregate.
 5. Brand, type and composition of cement.
 6. Brand, type and amount of each admixture.
 7. Amounts of water used in trial mixes.
 8. Proportions of each material per cubic yard.
 9. Gross weight and yield per cubic yard of trial mixtures.
 10. Measured slump.
 11. Measured air content.
 12. Compressive strength developed at 3, 7, 21 and 28 days, from not less than 3 test

cylinders cast for each 7-day and 28-day test, and for each design mix.

- D. Submit written reports to the City DWM of proposed mix of concrete at least 15 days prior to start of Work. Do not begin concrete production until complaint mixes have been submitted.
- E. Laboratory Trial Batches: When laboratory trial batches are used to select concrete proportions, prepare test specimens and conduct strength test as specified in ACI 301, Chapter 3 - Proportioning, Method 1. 4,000 psi concrete mixes need not be designed for greater than 4,600 psi regardless of the production facilities standard deviation.
- F. Field Experience Method: When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301, Chapter 3, Method 2.
- G. Water-Cement Ratio Methods: If suitable data from field experience or laboratory trial batches cannot be obtained, concrete proportions may be established as specified in ACI 301, Chapter 3, Method 3.
- H. Adjustment to Concrete Mixes: Mix design adjustments may be approved by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the City DWM. Laboratory test data for revised mix designs and strength results must be submitted to the City DWM before using the revised mixes.
- I. Admixtures:
 - 1. Use air-entraining and water reducer admixtures in all concrete. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the prescribed limits.
 - 2. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control.
- J. Slump Limits: Proportion and design mixes to result in concrete slump at the point of placement as follows:
 - 1. For footings and substructure walls, not less than 1-inch and not more than 3-inches.
 - 2. For slabs on grade, elevated concrete floors, beams, walls and columns, not less than 1- inch and not more than 4-inches.

2.04 CHEMICAL HARDENER

Unless otherwise specified, all interior concrete floors shall be treated with a liquid hardener composed of magnesium and zinc fluorosilicates combined with an anionic

surfactant for improved wetting penetration. Liquid hardener shall be colorless, nontoxic, nonflammable, and compatible with and providing good adhesion for subsequent toppings and/or coatings. Liquid hardener shall be suitable for use on new or old concrete floors and shall comply with Corps of Engineer Specification 204.

2.05 EPOXY BONDING AGENT

Provide an epoxy-resin bonding agent as specified in Section 03250 of these Specifications, everywhere new concrete is poured against old or when the new concrete has been left 30 days or more without the following new pour place against it.

2.06 CONCRETE CURING MATERIALS

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

PART 3 EXECUTION

3.01 CONCRETE MIXING

- A. General:
 - 1. Concrete may be produced at batch plants or it may be produced by the ready-mixed process. Batch plants shall comply with the recommendations of ACI 304 and shall have sufficient capacity to produce concrete of the qualities specified, in quantities required to meet the construction schedule. All plant facilities are subject to testing laboratory inspection.
 - 2. Mixing:
 - a. Mix concrete with industry-standard rotating type batch machine, except where hand mixing of very small quantities.
 - b. Remove hardened accumulations of cement and concrete frequently from drum and blades to assure acceptable mixing action.
 - c. Replace mixer blades when they have lost 10 percent of their original height.
 - d. Use quantities such that a whole number of bags of cement is required, unless otherwise permitted.
- B. Ready-Mix Concrete:

1. Comply with the requirements of ASTM C94, and as herein specified.
 - a. Plant equipment and facilities: Conform to National Ready Mix Concrete Association "Plant and Delivery Equipment Specification".
 - b. Mix concrete in revolving type truck mixers which are in good condition and which produce thoroughly mixed concrete of the specified consistency and strength.
 - c. Do not exceed the proper capacity of the mixer.
 - d. Mix concrete for a minimum of two minutes after arrival at the job site, or as recommended by the mixer manufacturer.
 - e. Do not allow the drum to sit while in transit.
 - f. Mix at proper speed until concrete is discharged.
 - g. Maintain adequate facilities at the job site for continuous delivery of concrete at the required rates.
 - h. Provide access to the mixing plant for the City DWMat all times.
- C. Maintain equipment in proper operating condition, with drums cleaned before charging each batch. Schedule rates of delivery in order to prevent delay of placing the concrete after mixing, or holding dry-mixed materials too long in the mixer before the addition of water and admixtures.

3.02 TRANSPORTING CONCRETE

- A. Transport and place concrete not more than 60 minutes after water has been added to the dry ingredients.
- B. Take care to avoid spilling and separation of the mixture during transportation.
- C. Do not place concrete in which the ingredients have been separated.
- D. Do not retemper partially set concrete, and do not add any water at the jobsite.
- E. Use suitable equipment for transporting concrete from mixer to forms.

3.03 CONCRETE PLACEMENT

- A. General: Place concrete continuously so that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Where new concrete is placed next to existing, or a section cannot be placed continuously, provide construction joints as specified in Section 03250, Concrete Joints. Apply epoxy bonding agent and waterstop as close as possible to time of actual concrete placement. Do not allow epoxy bonding agent to dry. Deposit concrete as nearly as practical in its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure which will cause segregation.

1. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
2. Do not use concrete which becomes non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the job site and dispose of it in an acceptable location.
3. Do not place concrete until all forms, bracing, reinforcement, and embedded items are in final and secure position.

B. Place concrete only when Contractor is present. Concrete Conveying:

1. Handle concrete from the point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit as rapidly as practical by methods which will prevent segregation and loss of concrete mix materials.
2. Provide mechanical equipment for conveying concrete to ensure a continuous flow of concrete at the delivery end. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the locations of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice and other deleterious materials.
3. Do not use chutes for distributing concrete.
4. Pumping of concrete is permitted however, do not use aluminum piping to convey the concrete.

C. Placing Concrete into Forms:

1. Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place concrete at such a rate that concrete which is being integrated with fresh concrete is still plastic with adequate vibration.
2. Do not permit concrete to free fall within the form from a distance exceeding 4 feet. Use "elephant trunks" and tremies to prevent free fall and excessive splashing on forms and reinforcement.
3. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.
4. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the applicable recommended practices of ACI 309.

5. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the layer of concrete and at least 6 inches into the preceding layer. So not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
6. Force concrete under pipes, sleeves, openings and inserts from one side until visible from the other side to prevent voids.

D. Placing Concrete Slabs and Sidewalks:

1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of expansion joints, until the placing of a panel or section is completed.
2. Consolidate concrete during placing operations using mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Bring slab surfaces to the correct level. Smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations. Coordinate applying contraction joint, as specified in Section 03250, with finishing operations.

E. Bonding for Next Concrete Pour: Comply with Division 03250 and 03300 of these Specifications.

F. Quality of Concrete Work:

1. Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.
2. All concrete for liquid retaining structures, and all concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
3. Cut out or chip out and properly replace surfaces which contain cracks or voids, are unduly rough, or are in any way defective beyond what is accepted by industry standards. Thin patches or plastering will not be acceptable.
4. All leaks through concrete, and cracks, holes or other defective concrete in areas of potential leakage, shall be repaired and made watertight by the Contractor.
5. Repair, removal, and replacement of defective concrete shall be at no additional cost to the City DWM.

G. Cold Weather Placing:

1. Protect all concrete Work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 and as herein specified.
2. When the air temperature has fallen to or may be expected to fall below 40 F, provide adequate means to maintain the temperature, in the area where concrete is being placed, at between 50⁰ F and 70⁰ F for at least seven days after placing. Provide temporary housings or coverings including tarpaulins or plastic film. Maintain the heat and protection, if necessary, to insure that the ambient temperature does not fall below 30⁰ F in the 24 hours following the seven-day period. Avoid rapid dry-out of concrete due to overheating, and avoid thermal shock due to sudden cooling or heating.
3. When air temperature has fallen to or is expected to fall below 40 F uniformly. Heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 55⁰ F and not more than 90⁰ F at point of placement.
4. Do not use frozen materials containing ice or snow. Ascertain that forms, reinforcing- steel, and adjacent concrete surfaces are entirely free of frost, snow and ice before placing concrete.
5. Do not use salt and other materials containing anti-freeze agents or chemical accelerators, or set-control admixtures in mix designs.

H. Hot Weather Placing:

1. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
2. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90⁰ F when the temperature is rising and below 85⁰ F when the temperature is falling. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated by the Contractor in the total amount of mixing water.
3. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
4. Wet forms thoroughly before placing concrete.

5. Do not place concrete at a temperature so as to cause difficulty from loss of slump, flash set, or cold joints.
6. Do not use set-control admixtures in mix designs.

3.04 FINISH OF FORMED SURFACES

A. Rough Form Finish:

1. Standard rough form finish shall be the concrete surface having the texture imparted by the form material used. For vertical surfaces, all tie holes and defective areas to be repaired and patched with mortar of 1 part cement to 1 1/2 parts sand and all fines and other projections exceeding 1/4 inch in height rubbed down or chipped off.
2. Use rough form finish for the following:
 - a. Exterior vertical surfaces up to 1 foot below grade.
 - b. Interior exposed vertical surfaces of liquid containers up to operating floor level except areas to receive sealers and/or coatings.
 - c. Undersides of breakaway of slabs.
 - d. Other areas shown.

B. Smooth Form Finish:

1. Produce smooth form finish by selecting form materials which will impart a smooth, hard, uniform texture. Arrange panels in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas as above with all fins or other projections completely removed and smoothed.
2. Use smooth form finish for surfaces that are to be covered with a coating material. The material may be applied directly to the concrete or may be a covering bonded to the concrete such as waterproofing, damp proofing, painting or other similar system.

C. Smooth Rubbed Finish:

1. Provide smooth rubbed finish in accordance with ACI 304, to concrete surfaces which have received smooth form finish and receive as follows:
 - a. Rubbing of concrete surfaces not later than the day after form removal.
 - b. Moistening of concrete surfaces and rubbing with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
2. Except where surfaces have been previously covered as specified above, use smooth rubbed finish for the following:

- a. Exterior exposed walls and other vertical surfaces down to 1 foot below grade.
 - b. Exterior horizontal surfaces, except exterior exposed slabs and sidewalks.
 - c. Interior exposed vertical surfaces.
 - d. Other areas shown.
3. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a texture matching the adjacent formed surfaces. Continue the final surface treatment of formed surfaces uniformly across the adjacent unformed surfaces, unless otherwise shown.

3.05 MONOLITHIC SLAB FINISHES

- A. Float Finish: After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently. Use a wood float only. Check and level the surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10 foot straightedge placed on the surface at not less than 2 different angles. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.
- B. Trowel Finish:
1. After floating, begin the first trowel finish operation using a power-finish trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.
 2. Consolidate the concrete surface by final hand troweling. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8 inch in 10 feet when tested with a 10 foot straight edge, and all edges adjacent to walls will have a struck, tooled intersection joint. Apply to operating floor slab.
- C. Non-Slip Broom Finish:
1. Apply non-slip broom finish to exterior concrete platforms, sidewalks, drives, interior drive areas and elsewhere as required.
 2. Immediately after trowel finishing, slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route. Use fiber-bristle broom unless otherwise directed. Coordinate the required final finish with the City DWM before application.

3.06 CONCRETE CURING AND PROTECTION

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.
2. Start initial curing after placing and finishing concrete as soon as free moisture has disappeared from the concrete surface. Keep continuously moist for not less than 72 hours.
3. Begin final curing procedures immediately following initial curing and before the concrete has dried. Continue final curing for at least 7 days and in accordance with ACI 301 procedures. Avoid rapid drying at the end of the final curing period.

B. Curing Methods:

1. Perform curing of all concrete by moist curing or by moisture-retaining cover curing. Use curing compound as herein specified. For curing, use water that is free of impurities which could etch or discolor exposed, natural concrete surfaces.
2. Provide moisture curing by any of the following methods:
 - a. Keeping the surface of the concrete continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet with sprinklers or porous hoses. Place absorptive cover so as to provide coverage of the concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
3. Provide moisture-retaining cover curing as follows:
 - a. Cover the concrete surfaces with the specified moisture-retaining cover for curing concrete, placed in the widest practical width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive.
 - b. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.
4. Provide liquid curing compound as follows:
 - a. Apply the specified curing and sealing compound to all exposed slabs not receiving chemical hardener or epoxy floor sealer. The compounds shall be applied immediately after final finishing in a continuous operation by power

spray equipment in accordance with the manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain the continuity of the coating and repair damage to the coat during the entire curing period.

- b. For concrete surfaces which will be in contact with potable water, the manufacturer shall certify that the curing compound used is nontoxic. Liquid curing compound will only serve as the initial step. Final cure by providing a moisture-retaining cover. Curing compound with petroleum or wax bases are not acceptable.

C. Curing Formed Surfaces:

Cure formed concrete surfaces, including the walls, supported slabs and other similar surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above.

D. Curing Unformed Surfaces:

1. Initially cure unformed surfaces, such as slabs, sidewalks and other flat surfaces by applying the specified curing compound.
2. Final cure unformed surfaces, unless otherwise specified, by moisture-retaining cover curing.
3. Provide moisture curing for surfaces receiving chemical hardener or epoxy floor sealer.

E. Temperature of Concrete During Curing:

1. When the atmospheric temperature is 40⁰ F and below, maintain the concrete temperature between 50⁰ F and 70⁰ F continuously throughout the curing period. When necessary, make arrangement before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the concrete curing period. Provide cold weather protection complying with the requirements of ACI 306.
2. When the atmospheric temperature is 80⁰ F and above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering. Protect the concrete continuously for the concrete curing period. Provide hot weather protection complying with the requirements of ACI 305, unless otherwise specified.
3. Maintain concrete temperature as uniformly as possible, and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5⁰ F in any one hour and 50⁰ F in any 24 hour period.

4. Protection from Mechanical Injury: During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations.

3.07 FIELD QUALITY CONTROL

- A. Testing for concrete field quality control shall be performed by the Contractor's testing laboratory. The number of slump tests and cylinders taken shall be per industry and City DWM standards. Contractor shall make standard compression test cylinders and entrained air tests as specified below. Contractor shall also furnish all labor, material and equipment required including cones, rods, molds, air tester, thermometer, curing in an insulated storage box that is heated if necessary and all other incidentals required. Contractor shall furnish all necessary storage, curing, and transportation required by the testing.
- B. Quality Control Testing During Construction:
 1. Perform sampling and testing for field quality control during the placement of concrete, as follows:
 - a. Sampling Fresh Concrete: ASTM C172.
 - b. Slump: ASTM C143; one for each set of compressive strength test specimens.
 - c. Air Content: ASTM C231; one for each set of compression cylinders cast.
 - d. Compressive Strength Tests: ASTM C39; one set of compression cylinders for each 50 cubic yards of fraction thereof, of each mix design placed in any one day; 1 specimen tested at 3 and 7 days, and 2 specimens tested at 28 days.
 - i. Adjust mix if test results are unsatisfactory and resubmit for Contractor approval.
 - ii. Concrete which does not meet the strength requirements is subject to rejection and removal from the Work, or to other such corrective measures at the expense of the Contractor.
 - e. Compression Test Specimens: ASTM C1; make one set of 4 standard cylinders for each compressive strength test, unless otherwise directed.
 - f. Concrete Temperature: Test hourly when air temperature is 40 F and below, and when 80 F and above; and each time a set of compression test specimens is made.
 2. The testing laboratory shall submit certified copies of test results directly to the City DWM and the Contractor within 24 hours after tests are made.
- C. Evaluation of Quality Control Tests:
 1. Do not use concrete delivered to the final point of placement which has slump temperature or total air content outside the specified values.

2. Compressive strength tests for laboratory-cured cylinders will be considered satisfactory if the averages of all sets of the consecutive compressive strength tests equal or exceed the 28 day design compressive strength of the type or class of concrete; no individual strength test falls below the required compressive strength by more than 500 psi.
 - a. Where questionable field conditions may exist during placing concrete or immediately thereafter, strength tests of specimens cured under field conditions will be required by the Contractor to check the adequacy of curing and protecting of the concrete placed. Specimens shall be molded at the same time and from the same samples as the laboratory cured specimens.
 - i. Provide improved means and procedures for protecting concrete when the 28 day compressive strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders.
 - ii. When laboratory-cured cylinder strengths are appreciably higher than the minimum required compressive strength, field-cured cylinder strengths need not exceed the minimum required compressive strength by more than 500 psi even though the 85 percent criterion is not met.
 - iii. If individual tests of laboratory-cured specimens produce strengths more than 500 psi below the required minimum compressive strength, or if tests of field-cured cylinders indicate deficiencies in protection and curing, provide additional measures to assure that the load-bearing capacity of the structure is not jeopardized. If the likelihood of low-strength concrete is confirmed and computations indicate the load-bearing capacity may have been significantly reduced, tests of cores drilled from the area in question will be required at the Contractor's expense.
 - b. If the compressive strength tests fail to meet the minimum requirements specified, the concrete represented by such tests will be considered deficient in strength and subject to replacement, reconstruction or to other action approved by the Contractor in accordance with industry and City DWM standards, and shall be done at the Contractor's expense.

D. Testing Concrete Structure for Strength:

1. When there is evidence that the strength of the in-place concrete does not meet specification requirements, Contractor shall employ at his expense the services of a concrete testing service to take cores drilled from hardened concrete for compressive strength determination. Tests shall comply with ASTM C42 and the following:
 - a. Take at least 3 representative cores from each member or suspect area.
 - b. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85 percent and no single core is less than 75 percent of the 28 day required compressive strength, and at least 100% by 56 days.
 - c. Report test results in writing to City DWM on the same day that tests are made.

Include in test reports the Project identification name and number, date, name of Contractor, name of concrete testing service, location of test core in the structure, type of class of concrete represented by core sample, nominal maximum size aggregate, design compressive strength, compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plane of the concrete as placed, and the moisture condition of the core at time of testing.

2. Fill core holes solid with patching mortar, and finish to match adjacent concrete surfaces.
3. Conduct static load test and evaluations complying with ACI 318 if the results of the core tests are unsatisfactory, or if core tests are impractical to obtain.

3.08 MISCELLANEOUS CONCRETE ITEMS

Filling-In: Fill-in holes and openings left in concrete structures for the passage of work by other contractors with non-shrink nonmetallic grout as specified in Section 03600.

3.09 CONCRETE REPAIRS

A. Repair of Formed Surfaces:

1. Repair exposed-to-view formed concrete surfaces that contain defects which adversely affect the appearance of the finish. Surface defects that require repair include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, and holes left by the tie rods and bolts; fins and other projections on the surface; and stains and other discolorations that cannot be removed by cleaning.
2. Repair concealed formed concrete surfaces that may contain defects that adversely affect the durability of the concrete. Surface defects that require repair include cracks in excess of 0.01 inch wide, cracks of any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets, holes left by tie rods and bolts, and spalls except minor breakage at corners.
3. Pressure grout structural cracks, and cracks in water-holding structures, using one of the following:
 - a. Sikadur 35, Hi-Mod LV Gel by Sika Chemical Company.
 - b. 881 LPL Epoxy by the Burke Co.
 - c. Or equal.
4. Repair and patch defective areas with sand cement mortar immediately after removal of forms.

5. Cut out or chip out honeycomb, rock pockets, voids over 1/2-inch diameter, and holes left by tie rods and bolts, down to solid concrete but, in no case, to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing the cement mortar, thoroughly clean, dampen with water, and brushcoat the area to be patched with the specified bonding agent.
 - a. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, the patching mortar color will match the color of the surrounding concrete.
 - b. Contractor shall impart texture to repaired surfaces to match texture of existing adjacent surfaces. Provide test areas at inconspicuous locations to verify mixture, texture and color match before proceeding with the patching. Compact mortar in place and strike off slightly higher than the surrounding surface.
6. Fill holes extending through concrete by means of a plunger-type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to insure complete filling.
7. Sandblast exposed-to-view surfaces that require removal of stains, grout accumulations, sealing compounds, and other substances marring the surfaces. Use sand finer than No. 30 and air pressure from 15 to 25 psi.

B. Repair of Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to the tolerances specified for each surface and finish. Correct low and high areas as herein specified.
2. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope. Correct high and low areas as herein specified.
3. Repair finish of unformed surfaces that contain defects which adversely affect the durability of the concrete. Surface defects, as such, include crazing, cracks in excess of 0.01-inch wide or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, pop outs, honeycomb, rock pockets, and other objectionable conditions.
4. Grout structural cracks, and cracks in water holding structures, using one of the following:
 - a. Sikadur 35, Hi-Mod LV Gel by Sika Chemical Company.
 - b. 881 LPL Epoxy by the Burke Co.
 - c. Or equal.

5. Correct high areas in unformed surfaces by grinding, after the concrete has cured sufficiently so that repairs can be made without damage to adjacent area.
6. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Use one of the following:
 - a. Mastertop MP by Master Builders.
 - b. Sikatop by Sika Chemical Company.
 - c. Or equal.
7. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cut, and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen all concrete surfaces in contact with patching concrete and brush with the specified bonding agent. Place patching concrete before grout takes its initial set. Mix patching concrete of the same materials and proportions to provide concrete of the same type or class as the original adjacent concrete. Place, compact and finish as required to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
8. Repair isolated random cracks, and single holes not over 1-inch diameter, by the dry-pack method. Groove the top of cracks, and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen all cleaned concrete surfaces and brush with the specified bonding agent. Place dry-pack before the cement grout takes its initial set. Mix dry-pack, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched areas continuously moist for not less than 72 hours.

+++ END OF SECTION 03300 +++

SECTION 03410
PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 SCOPE

- A. This section covers the design, materials, fabrication, erection and related operations required to furnish and install precast concrete structures and accessory items.
- B. Precast concrete structures shall be provided with factory applied waterproofing.

1.02 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ACI 318 - Building Code Requirements for Reinforced Concrete
 - 2. ASTM C31 - Making and Curing Concrete Test Specimens in the Field
 - 3. ASTM C33 - Standard Specification for Concrete Aggregates
 - 4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 5. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
 - 6. ASTM C150 - Standard Specification for Portland cement
 - 7. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete
 - 8. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
 - 9. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete
 - 10. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 - 11. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures
 - 12. ASTM C890 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Pre-cast Concrete Water and Wastewater Structures

13. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures
 14. AWS D1.4 - Structural Welding Code - Reinforcing Steel
- B. Acceptable Manufacturers and Erectors: Manufacturers and erectors shall have a minimum of 2 years of experience in precast structural concrete work of the quality and scope required on this project. The manufacturer shall be PCI Certified and have an established quality assurance program in operation.
- C. Sampling and Testing:
1. General: Samples and tests required below and other tests are to be made by and at the Contractor's expense. The tests shall be performed by an independent commercial testing laboratory or by the manufacturer's lab. Certified copies of test reports shall be furnished as required in this Section and shall include all test data and results.
 2. Concrete Testing: During the progress of the work, plastic concrete, as delivered to the casting site, shall be sampled and tested for slump, air content and compressive strength in accordance with ACI 381, Part 2, Chapter 3, and Part 3, Chapter 4. No fewer than 6 cylinders shall be made during each concreting cycle. Not more than 1 test in 10 shall fall below the specified strength.
 3. Slump Tests: Slump tests shall be in accordance with ASTM C143.
 4. Failure to Meet Strength Requirements: If compressive strength tests fail to meet the above requirements, load tests shall be made in accordance with ACI 318. Units failing to meet requirements of the load tests shall not be used. Load tests shall be performed at the expense of the Contractor.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM for the Project record:
1. Shop Drawings: Furnish complete details of design, manufacture, fabrication, installation and erection. Location of all inserts and openings shall be shown.
 2. Design Calculations: Submit manufacturer's design calculations used in design of the precast concrete structure and certification, signed and sealed by a Professional Engineer registered in the State of Georgia that the structure design and construction comply with the specified design conditions and the referenced ASTM specifications.

3. Certified Test Reports: Before delivery of materials and equipment, four certified copies of the reports of all tests required in referenced ASTM specifications or specified herein shall be submitted to the City DWM. Testing shall have been performed in an independent laboratory suitable for performance of the tests. Test reports shall be accompanied by notarized certificates from the manufacturer certifying that the tested material and equipment is of the same type, quality, manufacture and make as that proposed to be supplied.
4. Submit evidence of manufacturer's plant PCI Certification.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage

1. Precast structures and sections shall be inspected upon delivery to the jobsite and stored in a manner that will prevent staining and damage.
2. Substantially damaged, cracked or broken structures and sections which are deemed unsuitable for the intended use shall be rejected and removed from the jobsite.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE SECTIONS

A. Design

1. Precast concrete structures shall comply with ASTM C858 except as modified herein.
2. The precast structures shall have the inside dimensions and minimum thickness of concrete in accordance with City DWM standards. Minimum structure wall and slab thickness shall be 6-inches if not indicated otherwise.
3. The structural analysis and design of the structures as well as lifting devices for all precast concrete structures shall be performed by the manufacturer of the precast materials.
4. Design loads
 - a. Design live and dead loads shall be in accordance with ASTM C857 and shall consist of dead load, live load, and impact load, water table hydrostatic load, and any other special loads that may be imposed upon the structure. Final design shall be based upon the governing live load that produces the maximum shear and bending moment in the given structure.

- b. The design and analysis of the structure shall be verified to insure that the anticipated field conditions and requirements for design loads are not greater than those specified in ASTM C857.
5. Provide openings in precast structures for piping and access. No field coring of openings will be allowed.
6. Before shipment, all precast concrete structures shall be inspected to determine that materials and workmanship conform to the requirements of these specifications.

2.02 MATERIALS

A. Portland Cement

1. Portland cement shall be ASTM C150, Type I/II. All cement used shall be obtained from a single mill. Use regular cement as necessary to meet color requirements.
2. When precast structures are required to match finish of cast-in-place concrete, the cement shall be of the same type, brand name, and source as that used in the cast-in-place work.

B. Aggregates

1. Concrete Aggregates shall conform to ASTM C33.
2. Lightweight Concrete Aggregates shall conform to ASTM C330.
3. Fine Aggregate shall be regular sand.

C. Concrete Aggregates: Concrete aggregates shall be clean, hard, strong, and durable inert material free from injurious deleterious material.

D. Water used in mixing concrete shall be clean and free from deleterious amounts of acids, alkalis or organic materials.

E. Admixtures, including air entraining (if used); ASTM C260 (air entraining); ASTM C 494 (chemical). All admixtures shall be from one source and shall be certified by the manufacturer to be free of chlorides. All admixtures shall be added at the mixer.

F. Reinforcing

1. Precast structure members shall be reinforced as required for structural stresses, temperature changes and handling.

2. Steel Reinforcement shall conform to ASTM A615, ASTM A616, or ASTM A617, Grade 40 or Grade 60.
 3. Welded Wire Fabric Reinforcement shall conform to ASTM A185.
- G. Forms: Forms shall be steel. Concrete forms or wood forms of a quality to produce a smooth finished product may also be used when approved by the Contractor.
- H. Form oil, or parting compound, shall not impair future coating of the concrete surfaces.
- I. Miscellaneous Connections: All anchors, dowels, bolts, steel welding inserts and connecting plates indicated and/or necessary in connection with the fabrication and erection of precast concrete sections shall be provided. They shall be positioned and shall be held in position rigidly to prevent displacement while concrete is being placed. On-site and off-site welding shall be in accordance with AWS D1.1 and AWS D12.1, as applicable.

2.03 MIXES

- A. Mixing Procedures: Mixing procedure shall be the same as for cast-in-place concrete.
- B. Concrete Properties
1. Water-cement ratio: maximum 40 pounds of water to 100 pounds of cement.
 2. Air-entrainment: 5%.
 3. Strength: minimum of 5000 psi compressive strength at 28 days.
 4. Do not use calcium chloride or other salts.

2.04 SEALANTS AND MORTAR

Sealants and mortar shall be as specified in Section 03300.

2.05 WATERPROOFING

Waterproofing shall be as recommended by the structure manufacturer and shall be a black bituminous compound of brush or spray consistency for application on below grade concrete surfaces.

2.06 SPECIFIED CAST-IN INSERTS

Inserts or cast-in attachments as required by other trades shall be purchased and furnished to manufacturer by trades involved and supplied to meet production. The Contractor shall coordinate with trades and manufacturer to assure inserts are provided prior to the manufacture of the precast structure.

2.07 CRACKS IN PRECAST CONCRETE

Precast concrete structures containing hairline cracks that are visible but not measurable by ordinary means may be accepted provided moist atmospheric conditions are not present. Cracks of width measurable by ordinary means (0.01-inch wide and over) shall be cause for rejection.

PART 3 EXECUTION

3.01 PRE-INSTALLATION INSPECTION

- A. Prior to installation of precast structures, the City DWM shall inspect the structures for compliance with the contract documents. Structures shall be free of all form marks and shall have all accessories necessary for handling and erection.
- B. All structures or sections that are cracked, chipped, stained or which in any way fail to comply with the contract requirements shall be subject to rejection.
- C. Defective structures or sections which in the Contractor's judgment are "job site repairable" may be repaired at the project site at no cost to the City DWM. Defective structures or sections which are "job site repairable" shall be identified and discussed with the City DWM. Repairs shall be completed in accordance with industry and City DWM standards and rejection of the repaired units by the City DWM shall not justify additional cost to the Contractor or an extension in the Contract time.

3.02 INSTALLATION

Prior to setting the precast concrete structure or sections, provide a base of six (6) inches of crushed stone material, compacted and level for a uniform bearing surface for precast concrete structure bottom. Extend crushed stone 12-inches beyond the edge of the structure base slab.

3.03 ERECTION

- A. General
 - 1. Erection of precast structure sections shall be in accordance with the Contractor's shop drawings. Prior to fabrication, the Contractor shall determine the method

proposed for the lifting, transporting, and placing of such members.

2. Precast structure or sections shall not be shipped from the plant site or erected until test cylinders show that the concrete has attained the required strength.
- B. Bearing Surfaces. Bearing surfaces shall be level and free from irregularities. Irregularities in bearing surfaces shall be leveled with a stiff cement mortar.
- C. Mortar shall be allowed to harden before installing the structure or sections. Sections shall be installed at right angles to bearings, drawn up tight without forcing or distortion and with side plumb.
- D. Grouting
1. Keyways between structure sections and other spaces shall be cleaned and filled solidly with grout. Grout that may have seeped through to surfaces in spaces below shall be removed before hardening.
 2. Grout shall consist of a mixture of cementitious materials and aggregate as specified hereinafter; water shall be added in sufficient quantity to produce a fluid mixture. Fine grout shall be provided in grout spaces less than 2-inches in any horizontal dimension or in which clearance between reinforcing and masonry is less than $\frac{3}{4}$ -inch. Coarse grout shall be provided in grout spaces 2-inches or greater in any horizontal dimensions or in which clearance between members is not less than $\frac{3}{4}$ -inch.
 3. Seals, gaskets, sealant and sealant backup shall be placed in vertical and horizontal joints between structure sections.

3.04 PLUGGING LIFT HOLES

Plug lift holes used for handling, with mortar. Hammer mortar into holes until dense and excess of paste appears, then smooth flush with adjoining surface.

3.05 CLEANING

After the completion of installation, all precast structures shall be cleaned by methods which will not damage the structure, sealants or adjacent materials.

3.06 WATERPROOFING

- A. Waterproofing shall be applied to all exterior surfaces of the structure. Apply in accordance with the manufacturer's instructions. Prior to backfilling, field apply waterproofing material on joints and damaged surfaces.
- B. Protect coating from damage during backfilling.

+++ END OF SECTION 03410 +++

**SECTION 03600
GROUT**

PART 1 GENERAL

1.01 SCOPE

- A. The work covered under this Section includes furnishing all labor, materials, equipment, and incidentals required to furnish and install grout.
- B. The types of grout include the following:
 - 1. Non-shrink, epoxy type
 - 2. Non-shrink, non-metallic type
 - 3. Cement-sand
 - 4. Masonry

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. In addition, the following specific information shall be provided:

- 1. Copies of manufacturer's specifications and installation instructions for all proprietary materials.
- 2. Reports and Certificates:
 - a. For proprietary materials, submit copies of reports on quality control tests.
 - b. For nonproprietary materials, submit certification that materials meet specification requirements.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ASTM C109 - Standard Specification for Compressive Strength of Hydraulic Cement Mortars (using 2-in. [or 50 mm.] Cube Specimens)
 - 2. ASTM C150 - Standard Specification for Portland cement

3. ASTM C191 - Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
4. ASTM C476 – Standard Specification for Grout for Masonry
5. ASTM C531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes
6. ASTM C827 – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
7. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
8. ASTM C1019 – Standard Test method for Sampling and Testing Grout
9. ASTM C1107 – Standard Specification for Packaged, Dry, Hydraulic Cement Grout (Nonshrink)
10. CRD C621 – Corps of Engineers Specifications for Non-Shrink Grout

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Prevent damage to or contamination of grouting materials during delivery, handling and storage.
- B. Store all grouting materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Non-shrink Epoxy Grout: Non-shrink epoxy grout shall be a 100% solids, premeasured, prepackaged system containing thermosetting epoxy resins, expansive additives and inert fillers. Non-shrink epoxy grout shall be equal to HP Epoxy grout as manufactured by Five Star Products, Inc.
- B. Non-Shrink, Non-Metallic Grout: Non-shrink, non-metallic grout shall be a pre-proportioned, prepackaged cement based grout requiring only the addition of potable water. The grout shall not contain metallic aggregate, expansive cement or additives. The grout shall contain an air release aggregate to generate expansion. Grout shall meet the performance requirements of ASTM C1107. Non-shrink non-metallic grout shall be equal to cementitious grout as manufactured by Five Star Products, Inc.

- C. Cement-Sand Grout:
 - 1. Except where otherwise specified use 1 part cement to 3 parts sand complying with the following:
 - a. Cement: ASTM C150, Type II.
 - b. Sand: ASTM C33.
 - 2. For water repelling and shrinkage reducing requirements use admixtures.
- D. Water: Water shall be clean, fresh, potable water free from injurious amounts of oils, acids, alkalis or organic matter.
- E. Masonry Grout:
 - 1. Masonry Grout shall conform to ASTM C476 and shall have a compressive strength of 2000 psi.
 - 2. Masonry grout shall be used for leveling surfaces and sloping surfaces.
- F. Epoxy Resin Adhesives:
 - 1. High-strength, structural, epoxy paste adhesive shall be a 2 component, 100% solids, moisture tolerant, high-modulus structural paste adhesive conforming to ASTM C881. Epoxy paste adhesive shall be used for structural bonding of concrete and masonry and for interior, vertical and overhead repair of concrete as an epoxy mortar binder. Epoxy paste adhesive shall be equal to Sikadur 31, Hi-Mod Gel as manufactured by Sika Corporation.
 - 2. High-modulus, high-strength, epoxy bonding/grouting adhesive shall be a multi-purpose 2 component 100% solids, moisture tolerant, structural epoxy adhesive conforming to ASTM C881. Epoxy adhesive shall be used for bonding fresh concrete to existing concrete and steel and grouting of horizontal cracks and joints in concrete by gravity feed. Epoxy adhesive shall be equal to Sikadur 32. Hi-Mod as manufactured by Sika Corporation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Place grout as shown where required in accordance with manufacturer's instructions.

2. Dry packing will not be permitted.
3. Manufacturers of proprietary products shall make available upon 72 hours notification the services of a qualified, full time employee to aid in assuring proper use of the product under job conditions.
4. Placing grout shall conform to temperature and weather limitations in Section 03300.
5. Surface to be grouted is to be adequately cured, cleaned dampened and roughened per manufacturer recommendations to insure adequate bonding.

B. Pipe Railings:

1. After posts have been properly inserted into the holes or sleeves, fill the annular space between posts and sleeve with the non-shrink, non-metallic grout. Bevel grout at juncture with post so that moisture flows away from post.
2. Do not grout railing designated as "removable sections".

C. Grout for Dowelling and Anchor Bolts:

1. Grout shall be introduced at the bottom of the drill holes using a caulking tube or other injection means. The hole shall be blown out or pumped dry prior to the introduction of grout into the hole. Care shall be taken to adequately fill the hole with grout before the dowel or anchor rod is inserted, to insure complete contact with the anchor for its full length.
2. A plug shall be placed in the top of the hole to hold the bars securely until the grout sets. Special care shall be taken to insure against any movement of the bars which have been placed.
3. Epoxy resin adhesive may be used in accordance with manufacturer's recommended application.

D. Grouting for Waterstops:

1. Grout for PVC waterstops to be the non-shrink, non-metallic type. Refer to Section 03250 for installation procedures.
2. Grout from ready-mix plant conforming to applicable requirements of Section 03300 may be substituted at no additional compensation to the Contractor.

- E. Grouting for Slide Gates: Provide minimum of 1-inch thickness of non-shrink, non-metallic grout under frames. Gates shall be coated with an epoxy coating prior to installing and grouting.
- F. Grouting for Bearing Plates and Equipment: Use non-shrink, non-metallic grout for setting bearing plates and equipment. Provide a minimum grout thickness of 1-inch.
- G. Patchwork at Demolition Areas:
 - 1. Furnish and install non-shrink, non-metallic grout for dry packing as required to patch all mechanical, electrical and miscellaneous penetrations which are either designated to be patched or are the result of abandoned, removed or relocated material and equipment. Prepare surface and place grout as recommended by manufacturer and as specified. Finish grout off flush with existing surface.
 - 2. Reinforce with wire mesh and use structural concrete for penetrations larger than 1/2 square feet. Conform to requirements of Sections 03100, 03200 and 03300.

+++ END OF SECTION 03600 +++

SECTION 04000
MASONRY

PART 1 GENERAL

1.01 SCOPE

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

1.02 SUBMITTALS

- A. Submit two samples each of concrete masonry units if requested by City DWM.
- B. Masonry Mortar: Submit manufacturer's specifications and instructions for each manufactured product as part of the Project record. Indicate that a copy of each applicable instruction has been distributed to the Masonry Installer if other than the Contractor.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.
 - 1. ASTM C62 – Standard Specification for Building Brick (Clay or Shale).
 - 2. ASTM C90 – Standard Specification for Load Bearing Concrete Masonry Units.
 - 3. ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 4. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.

5. ASTM C150 – Standard Specification for Portland Cement.
6. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
7. ASTM C270 – Standard Specification for Mortar for Unit Masonry.
8. ASTM C404 – Standard Specification for Aggregates for Masonry Grout.
9. ASTM C426 – Standard Specification for linear Drying Shrinkage of Concrete Masonry Units.
10. ASTM C476 – Standard Specification for Grout for Masonry.
11. NCMA – National Concrete Masonry Association.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

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

1.05 COLD WEATHER CONSTRUCTION

Masonry construction in cold weather shall conform to the applicable requirements of "Cold Weather Concrete Masonry" of the National Concrete Masonry Association (NCMA).

1.06 WARRANTY

Provide a warranty against defective equipment and workmanship in accordance with the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete Masonry Units:

1. Concrete masonry units (CMU) shall conform to ASTM C90, light weight, Grade N, Type I, hollow, load bearing units of 8-inch x 16-inch nominal face size. All exposed vertical corners shall be bull nosed.
2. CMU shall be free from substances that will cause staining or pop-outs, and shall be fine, even texture with straight and true edges. All units shall have been cured in an autoclave in an atmosphere steam at a pressure and temperature of approximately 150 psig. and 360 deg. F. Units shall have a maximum linear drying shrinkage of 0.25 percent (ASTM C426) and have a moisture content of time of delivery not exceeding 30 percent of total absorption.
3. Units shall be obtained from one manufacturer to insure even color and texture.

B. Brick:

1. Common brick shall conform to the requirements of ASTM C62.
2. Brick for manholes, junction boxes, catch basins and inlets shall be as specified in Section 02607.

2.02 REINFORCING, TIES, ANCHORS AND MISCELLANEOUS

- A. Wire joint reinforcement shall be welded wire units prefabricated in straight lengths of not less than 10 ft. with matching corner and tee units fabricated from cold-drawn steel wire complying with ASTM A82, with deformed continuous side rods and plain cross-rods, crimped for cavity wall construction.
- B. Single wythe reinforcement shall be truss type, fabricated with single pair of galvanized 9 gauge side rods and continuous 9 gauge diagonal cross-rods spaced not more than 16 - inch O.C.
- C. Reinforcing designated No. 3 and larger shall be deformed steel bars as specified in Section 03200.
- D. The Contractor shall provide and install miscellaneous anchors and attachment members, required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.

- E. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

2.03 MORTAR MATERIALS

- A. Portland cement shall conform to ASTM C150 Type II.
- B. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.
- C. Sand shall be clean, durable particles, free from injurious amounts of organic matter. The sand shall conform to the limits of ASTM C144. Sand for grout shall conform to ASTM C144 or C33 as required.
- D. Water shall be free from injurious amounts of oils, acids, alkalis or organic matter, and shall be clean and fresh.
- E. Mortar shall conform to ASTM C270, Type S, consisting of 1 part portland cement, 1/2 part lime, 4-1/2 parts sand, or other mix meeting industry and City DWM standards. Ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed.

2.04 GROUT MATERIALS

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

PART 3 EXECUTION

3.01 MORTAR AND GROUT

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

3.02 MASONRY INSTALLATION

- A. No material which is frozen or covered with frost or snow shall be used in the construction, and no antifreeze salts or ingredients shall be mixed with the mortar. Masonry shall not be laid at temperatures below 40 degree F and all work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below fifty degrees F for a period of seventy-two hours after placing. Any completed work found to be affected by freezing shall be taken down and rebuilt by the Contractor at his expense.
- B. All bricks shall be laid in full beds of mortar with shoved joints and with all joints slushed solidly in each course. Bond shall be common bond. Brick with more than eight percent absorption shall be damp when laid, except in freezing weather. All brickwork shall be laid up from an outside scaffold and shall be carried up simultaneously at an approximate level. No brick shall be laid overhand. Face bricks receiving minor handling defects shall be used in non-conspicuous surfaces. Distribution of light and dark bricks shall be as even as possible.
- C. All CMU shall be laid in a full mortar bedding applied to the entire horizontal face of the masonry unit. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid

so as to produce a well-compacted vertical mortar joint for the full shell thickness. Units shall set with all cells in a vertical position. The moisture content of the units when laid shall not exceed thirty-five percent of the total absorption as determined by laboratory test.

- D. All masonry units shall be laid in stretcher (running) bond unless otherwise shown. Tool dense and neat.
- E. Sizes shall be as required, and where "soaps" and "splits" are used, the space between these members and the backup material shall be slushed full of mortar.
- F. Joints of all masonry shall be tooled in accordance with the following:
 - 1. Wait until unit mortar is thumb-print hard before tooling joint. This may require as much as three hours in the shade and one hour in the sun in the summertime.
 - 2. The required personnel of the Contractor shall be kept on the job after hours, if necessary, to properly tool joints.
 - 3. Both vertical and horizontal joints shall be maintained uniform in spacing.
 - 4. Joints for CMU shall be 3/8-inch.
- G. Surfaces shall be brushed as work progresses and maintained as clean as it is practical. Unfinished work shall be raked back where possible, and tooled only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind, and before continuing, work previously laid shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by the elements by means of waterproof paper, tarpaulins, or boards.
- H. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
- I. All ties and reinforcing for masonry shall be furnished and installed by the Contractor. Grout solid all courses and cells which are reinforced. Place joint reinforcing (fully embedded in mortar) at 16 inches maximum vertically and lap 6 inches between lengths and corner and tee pieces.
- J. Bed and grout all steel, for equipment and machinery, and items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates, and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

3.03 CLEANING

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

+++ END OF SECTION 04000 +++

**SECTION 05500
MISCELLANEOUS METAL**

PART 1 GENERAL

1.01 SCOPE

The Contractor shall furnish all labor, materials, equipment and incidentals required and install all miscellaneous metals. The miscellaneous metal items include, but are not limited to, the following:

1. Anchors or anchor bolts except those specified to be furnished with equipment.
2. Ladders
3. Grating
4. Manhole frames and covers
5. Grates and frames
6. Manhole steps
7. Miscellaneous aluminum and steel items

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the Contract. In addition, the following specific information shall be submitted to the City DWM for the Project record:

1. Manufacturer's data on all materials listed in Part 2 of this Section.
2. Detail drawings showing sizes of members, method of assembly, anchorage, and connection other members shall be submitted to the City DWM before fabrication.

1.03 QUALITY ASSURANCE

Reference Standards: The Contractor shall comply with the applicable provisions and recommendations of the latest editions of the following standards.

1. ASTM A36 – Standard Specification for Carbon Structural Steel
2. ASTM A48 – Standard Specification for Grey Iron Castings

3. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
4. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
5. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
6. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
7. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes
8. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
9. ASTM B241 – Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
10. AWS Specifications for Arc Welding

1.04 COORDINATION

- A. The work of this Section shall be completely coordinated with the work of other Sections.
- B. Verify at the site both the dimensions and work of other trades adjoining items of Work in this Section before fabrication and installation of items herein specified.
- C. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.05 FIELD MEASUREMENTS

Field measurements shall be taken at the site to verify or supplement indicated dimensions and to insure proper fitting of all items.

1.06 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this section, before during and after installation and to protect the work and materials of all other trades.
- B. Delivery and storage: Deliver materials to the jobsite, and store in a safe dry place with all labels intact and legible at the time of installation.

- C. Replacement: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the City DWM.

1.06 WARRANTY

Provide a warranty against defective equipment and workmanship in accordance with the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 ANCHORS, BOLTS AND FASTENING DEVICES

- A. Anchors, bolts and fastening devices shall be furnished as necessary for installation of the work of this Section.
- B. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Aluminum and stainless steel shall be attached to concrete by means of stainless steel machine bolts and iron or steel shall be attached with steel machine bolts unless otherwise specifically noted.
- C. For structural purposes, unless otherwise noted, expansion bolts shall be Wej-it "Ankr-Tite", Phillips Drill Co. "Wedge Anchors", or HILTI-HIT(C-100). The length of bolt provided shall be sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the reinforcing steel within the concrete.
- D. Material shall be stainless steel.

2.02 ALUMINUM ITEMS

- A. Miscellaneous aluminum shapes and plates shall be fabricated as shown. Angle frames for hatches, beams, grates, etc., shall be furnished complete with welded strap anchors attached. Furnish all miscellaneous aluminum shown but not otherwise detailed. Structural shapes and extruded items shall conform to the required dimensions within the tolerances published by the Aluminum Association.
- B. Ladders
 - 1. Ladders shall be high strength 6061-T6 aluminum alloy and shall be fabricated to the required height. Rung diameter shall be 1-inch minimum with 12-inches spacing between rungs and 18-inches between ladder rails. Ladder rungs shall have slip resistant surface. Ladders shall have a minimum of 3 pairs of brackets for wall attachment.
 - 2. Ladders shall meet the requirements of OSHA and ANSI standards.

3. Ladders shall be furnished with safety posts to allow for a hand-hold when entering or exiting vaults and other structures.
 - a. Safety posts shall be 48-inches long when fully extended. The safety post shall have a telescoping tubular section that locks automatically when fully extended and a release lever to allow it to be returned to its lowered position.
 - b. Safety post shall be manufactured of high strength square tubing.
 - c. All hardware for mounting safety post to ladder shall be type 316 stainless steel and shall be furnished by the post manufacturer.
 - d. Ladder safety post shall be preassembled by the manufacturer and shall be LadderUP Safety Post Model LU-4 as manufactured by the Bilco Company or equal.

C. Grating

1. Aluminum grating shall be 1 ¼-inch minimum thickness and shall be designed to support a loading of 150 pounds per square foot.
2. All openings 2-inches or greater in diameter shall be banded with a bar of the same depth and thickness as the main bearing bars of the grating, or furnished with continuous cross bridges. Each cut bar shall be welded to the band if banding is utilized. The ends of all grating sections shall be likewise banded.
3. Clamps and bolts used for attaching grating to support members shall be stainless steel. All grating shall be clamped unless noted otherwise. Clamps shall be as recommended by the grating manufacturer.

2.03 MANHOLE FRAMES AND COVERS AND GRATES AND FRAMES

- A. Castings for manhole frames and covers and grates and frames shall conform to ASTM A48 for Class 30 gray iron castings. Castings shall be made accurately to the dimensions required. Castings for manhole frames and covers and frames and grates shall be 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. Castings shall be thoroughly cleaned and painted or coated with bituminous paint. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
- B. Manhole frames and covers and grates and frames shall be fitted before leaving the foundry.
- C. Manhole Frames and Covers

1. Manhole frames and covers shall be as manufactured by East Jordan Iron Works or equal.
 2. Manhole covers on sanitary sewer systems shall be solid type.
 3. Manhole covers on storm drainage systems shall be vented.
 4. Watertight manhole frames and covers shall be bolt down type and shall be equipped with four 5/8-inch stainless steel bolts and O-ring gasket.
 5. Manhole covers installed on air release and vacuum valve vaults shall be vented.
- D. Grates and Frames: Grates and frames shall be as manufactured by East Jordan Iron Works or equal.

1.04 STEEL ITEMS

- A. Manhole Steps
1. Manhole steps shall be made of a steel rod encapsulated in copolymer polypropylene and shall be model PS-1 PF as manufactured by M. A. Industries, Inc., or equal.
 2. Manhole steps shall be installed at required intervals. Steps shall have rod and pull ratings meeting OSHA standards.
- B. Miscellaneous steel shall be fabricated and installed as required and shall include: beams, angles, support brackets, splice plates, anchor bolts (except for equipment furnished in other Divisions of the specifications), lintels and any other miscellaneous steel required and not otherwise specified.
- C. Stainless Steel. Unless otherwise designated, use stainless steel alloy types as follows which conform to ASTM A167 and ASTM A276.
1. Stainless steel plates and bars shall be Type 316 or Type 317 unless otherwise noted.
 2. Stainless steel anchor bolts shall be Type 316.
 3. Stainless steel bolts, nuts and washers shall be Type 316.

PART 3 EXECUTION

3.01 FABRICATION

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.
- B. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.
- C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.
- D. Welding of parts shall be in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the AWS. All welding shall be done only by welders certified as to their ability to perform welding in accordance with the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.
- E. Welding of aluminum work shall be on the unexposed side as much as possible in order to prevent pitting or discoloration.
- F. All aluminum finish exposed surfaces, except as specified below, shall have manufacturer's standard mill finish. A coating of methacrylate lacquer shall be applied to all aluminum before shipment from the factory.
- G. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field at the City DWM's option. All finished surfaces shall be machined to a true plane surface and shall be true and seat at all points without rocking. Allowances shall be made in the patterns so that the thickness specified or shown shall not be reduced in obtaining finished surface. Castings will not be acceptable if the actual weight is less than 95 percent of the theoretical weight computed from the dimensions shown. The Contractor shall provide facilities for weighing castings in the presence of the City DWM showing true weights certified by the supplier.
- H. All steel finish work shall be thoroughly cleaned, by effective means, of all loose mill scale, rust, and foreign matter before shipment and shall be given one shop coat of primer compatible with finish coats specified in Painting Section after fabrication but before shipping. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces, Abrasions in the field shall be touched up with primer immediately after erection.

- I. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Following all manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the batch until their temperature becomes the same as the bath. Coating shall be not less than 2 oz. per sq. ft. of surface. The galvanized coating shall be chromate treated.

3.02 INSTALLATION

- A. Install all items furnished except items to be imbedded in concrete which shall be installed under Division 3. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown and in accordance with manufacturer's instructions and shop drawings. All dimensions shall be verified at the site before fabrication is started.
- B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.
- C. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to dissimilar metal.
- D. Where aluminum contacts concrete, apply a heavy coat of alkali resistant paint to the concrete.

+++ END OF SECTION 05500 +++

SECTION 15100
VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE

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

1.02 DESCRIPTION OF SYSTEMS

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

1.03 QUALITY ASSURANCE

Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards.

- 1. ANSI/AWWA C504 – Rubber-Seated Butterfly Valves
- 2. ANSI/AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
- 3. ANSI/AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.

4. ANSI/AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.
5. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
6. ANSI/NSF Standard 61 – Drinking Water System Components – Health Effects

1.04 SUBMITTALS

Submittals shall be in compliance with the requirements of the Contract Documents. In addition, the following specific information shall be provided to the City DWM for the Project record:

1. Complete shop drawings of all valves and appurtenances
2. Manufacturer’s certificate certifying that the products meet or exceed the specified requirements

1.05 TOOLS

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

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

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

2.02 GATE VALVES (GV)

- A. 20-Inches in Diameter and Smaller:
 1. Gate valves shall be resilient seated type conforming to the requirements of AWWA C509 or AWWA C515.
 2. Valves shall have a minimum working pressure of 250 psi.
 3. Valve manufacturer shall submit an affidavit to the City DWM indicating valve compliance with all applicable AWWA standards.

4. Valves less than 4-inches in diameter shall have threaded ends. Larger valves shall be mechanical joint.
5. Valve shall be non-rising stem type with a 2-inch square operating nut and shall open right (clockwise).
6. All internal and external ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall conform to ANSI/AWWA C550 and shall be applied electrostatically prior to assembly. Epoxy shall be NSF61 approved.
7. Valve shall have a ductile iron body, bonnet and stuffing box. All joints between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be supplied with O-ring seals.
8. Valve wedges shall be symmetrical, made of ductile iron and totally encapsulated in rubber. Rubber shall be permanently bonded to the wedge per ASTM D429.
9. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.

B. 24-Inches in Diameter and Larger:

1. Gate valves shall be resilient seated type conforming to the requirements of AWWA C509 or AWWA C515.
2. Valves shall have a minimum working pressure of 250 psi.
3. Valve manufacturer shall submit an affidavit to the City DWM indicating valve compliance with all applicable AWWA standards.
4. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type operator.
5. Valve ends shall be mechanical joint type except where restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
6. Valve shall be non-rising stem type with a 2-inch square operating nut and shall open right (clockwise).
7. All internal and external ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall conform to ANSI/AWWA C550 and shall be applied electrostatically prior to assembly. Epoxy shall be NSF61 approved.

8. Valve shall have a ductile iron body, bonnet and stuffing box. All joints between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be supplied with O-ring seals.
9. Valve wedge shall be symmetrical, made of ductile iron and totally encapsulated in rubber. Rubber shall be permanently bonded to the wedge per ASTM D429.
10. Valves shall be non-rising stem type with a 2-inch square operating nut and shall open right (clockwise).
11. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.

2.03 BUTTERFLY VALVES (BV)

A. Class 150 Valves:

1. Class 150 butterfly valves shall be short body design and shall be designed, manufactured and tested in accordance with the requirements of ANSI/AWWA C504 for Class 150B butterfly valves.
2. Valve bodies shall be ductile iron conforming to ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Shafts shall be ASTM A276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron.
3. The valve shall have a resilient seat.

B. Class 250 Valves:

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

- c. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the City DWM.
- C. 24-inch and larger valves shall have a resilient seat that is located either on the valve disc or in the valve body. The valve seat shall be fully field adjustable and field replaceable.
- D. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
- E. Actuators
 - 1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured and tested in accordance with ANSI/AWWA C504. Actuators shall be capable of holding the valve disc in any position between full open and full closed without any movement or fluttering of the disc.
 - 2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices to prevent over travel of the valve disc in the open and closed positions. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
 - 3. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.
- F. The valve actuator shall be factory mounted on the valve by the valve manufacturer and shipped to the project site as a complete operating unit. Valve shall be designed to open right (counterclockwise).
- G. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are required. Flange joints shall meet the requirements of ANSI B16.1, Class 125.
- H. Butterfly valves shall be manufactured by Mueller, Pratt or DeZurik.

2.04 BYPASS VALVES AND PIPING

- A. Valves 24-inches in diameter and larger shall be installed with bypass piping and valve as specified in the following table:

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

2.06 VALVE BOXES (VB) AND EXTENSION STEMS

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

2.07 WRENCHES

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

2.08 VALVE MARKERS (VM)

For installed valves, the Contractor shall furnish and install a concrete valve marker in accordance with City DWM standards, except on hydrant isolation valves. Valve markers shall be stamped "WATER".

2.09 TAPPING SLEEVES AND GATE VALVES (TS&V)

- A. Tapping sleeves for mains 12-inches in diameter and smaller shall be ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be equal to Mueller H-615.
- B. Tapping sleeves for mains larger than 12-inches shall be of all stainless steel construction.
- C. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. The tapping sleeve shall be rated for 250 psi. working pressure
- D. Valves shall be gate valves as specified in Paragraph 2.02 of this Section, with a flanged connection to the tapping sleeve and a mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer.

2.10 METER BOX SAMPLING STATION

- A. Sampling station shall be meter box, retrofit style. Inlet and outlet connections shall be standard 3/4-inch meter threads. The station shall consist of a standard meter re-setter with the inlet leading up through the water system's residential meter, through a check valve and then out an outlet.
- B. The sampling station shall consist of a 1/2-inch lockable shut off valve leading to a valve riser and a 3/8-inch male quick disconnect valve. The valve and riser shall be positioned directly in line with the meter setter to avoid turning of the entire sampling station when pushing the sampling rod down on the valve.
- C. Sampling station parts shall be brass.
- D. Sampling station shall be furnished with a plastic PVC push on cap to protect the quick disconnect valve when not in use. The cap shall be sealed watertight with an O-ring below the quick disconnect valve.
- E. A portable sampling rod shall also be provided with each sampling station. The sampling rod shall be furnished with a female inlet which shall couple to the male quick coupling, and a quarter turn valve. The rod shall be brass and shall have two outlets, one for flushing and the other for sampling.

- F. The meter box sampling station and portable sampling rod shall be equal to Kupferle Foundry Company, Model 94WM

2.11 FLANGE INSULATION GASKET KITS

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

2.12 ELECTRONIC LOCATING AND MARKING SYSTEMS

- A. The Contractor shall furnish and install an electronic locating and marking system for all buried water main piping. System shall consist of electronic markers buried above the water main and stand-alone locators.
- B. The marker shall contain an antenna or three orthogonal tuned circuits. Electronic ball markers shall be made of high strength 4 1/2-inch (maximum) diameter plastic. Electronic ball markers shall be 3M EMS model 1403-XR as manufactured by 3M, Omni Markers as manufactured by Tempo or equal.
- C. Full range markers shall be equal to EMS model 1252 as manufactured by 3M or equal.
- D. The Contractor shall also furnish two (2) 3M Dynatel locators. Locators shall be 3M model 2250M-ID/UU3W-RT or equal.

PART 3 EXECUTION

3.01 INSTALLATION

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

3.02 LAYING AND JOINTING VALVES AND APPURTENANCES

- A. Valves, fittings, plugs, and caps shall be set and joined to the pipe in accordance with the manufacturer's recommendations for cleaning, laying and joining pipe. Twelve (12) inch and larger valves shall be provided with special support, such as crushed stone, concrete pads or a tamped trench bottom so that the pipe will not be required to support the weight of the valve.
- B. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
- C. A valve box shall be provided on each buried valve. The valve box shall be set over the center of the valve operating nut and plumbed. The box shall not transmit shock or stress to the valve. The bottom portion of the lower belled portion of the box shall be placed below the valve operating nut. The flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surrounding surface.
- D. Underground valves shall be installed in vaults. The vault shall be precast or cast-in-place concrete of a size required to provide clearances for access to the valve for maintenance. The valve box shall not transmit shock or stress to the valve. The valve vault cover shall be flush with the surface of the finished area or such other level.
- E. Settlement Joints: The first joint on all pipe connected to and outside of a valve vault shall be designed to allow differential settlement. The following joints will be allowed for settlement:
 - 1. Steel Pipe shall use a bolted, sleeve style coupling with joint harness as specified in AWWA M11.
 - 2. Ductile iron pipe shall use standard gasketed joints if unrestrained, or mechanically restrained gasketed joints if required by thrust restraint design.
- F. Pipe within 20 feet of each side of a direct-buried butterfly valve shall be protected from vertical deflection to protect proper function of butterfly valve. Vertical deflection of pipe shall be limited to butterfly valve manufacturer recommendation.

3.03 BLOW-OFFS

Blow-offs shall be installed in required locations. Blow-offs shall not be connected to any sewer, submerged in any stream or creek, or be installed in any manner that will permit back siphoning into the water distribution system.

3.04 ELECTRONIC LOCATING AND MARKING SYSTEM

- A. The Contractor shall install a ball marker at each bend, tee, valve and 500 feet of pipe length installed.

- B. Ball markers shall be installed at a maximum depth of 5 feet.
- C. Ball markers shall be secured to the pipe with cable ties meeting City DWM standards and shall be installed in accordance with the manufacturer's instructions.
- D. Full range markers shall be installed on bends, tees, valves and pipe with 5-feet of cover or greater.

3.05 TESTING

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

+++ END OF SECTION 15100 +++

SECTION 15150
WATER SUPPLY BACKFLOW PREVENTION ASSEMBLIES

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment and incidental required and install complete and ready for operation all backflow prevention assemblies.
- B. Items included under this Section include, but not be limited to the following:
 - 1. Double Detector Check Backflow Preventer Assembly
 - 2. Reduced Pressure Zone Backflow Preventer Assembly.

1.02 DESCRIPTION OF SYSTEMS

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

1.03 QUALITY ASSURANCE

Reference Standards: The design, manufacturing and assembly of elements of the products herein specified shall comply with the applicable provisions and recommendations of the latest editions of the following standards.

- 1. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
- 2. ANSI/AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
- 3. ANSI/AWWA C510 – Double Check Valve Backflow Prevention Assembly
- 4. ANSI/AWWA C511 – Reduced- Pressure Principle Backflow Prevention Assembly
- 5. ANSI/AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service

1.04 SUBMITTALS

Submittals shall be in compliance with the requirements of the Contract. In addition, the following specific information shall be provided to the City DWM for the Project record:

1. Complete shop drawings of all assembly components
2. Test Reports
3. Manufacturer's certificate certifying that the products meet or exceed the specified requirements

1.05 TOOLS

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

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All assembly components shall be of the size required and all equipment of the same type shall be from one manufacturer.
- B. All assembly components shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon an appropriate part of the body.

2.02 DOUBLE DETECTOR CHECK BACKFLOW PREVENTER ASSEMBLY

- A. Double detector check (DDC) backflow preventer (BFP) assembly shall be provided in sizes to match that of the required fire line service piping.
- B. The DDC-BFP assembly shall be provided with OS&Y gate valves on the inlet and outlet sides of the assembly.
- C. The DDC-BFP assembly shall be provided with three brass ball valve test cocks fitted with brass or plastic threaded plugs. A fourth test cock shall be provided on the upstream side of the inlet shut off valve.
- D. The DDC-BFP assembly and shut off valve bodies shall be cast iron, coated inside and outside with an NSF approved, fused epoxy coating and assembled with bolts that are resistant to electrolysis. All DDC-BFP assembly interior and exterior components shall be of materials equal in corrosion resistance to bronze and/or stainless steel to resist electrolysis.
- E. Check valves shall have replaceable seats and shall be accessible by top entry only for maintenance and repair. The detector bypass line on the DDC-BFP assembly shall be $\frac{3}{4}$ -inch copper and have a bronze detector meter and a $\frac{3}{4}$ -inch DCV-BFP complete with unions and shut off valves.

- F. The DDC-BFP assembly shall be classified or listed by the Underwriters Laboratories, Factory Mutual Insurance and bear the ASSE seal (ASSE Standard 1049). The DDC-BFP assembly shall also have the approval of and conform to all requirements of the University of Southern California, Foundation for Cross Connection Control (USC-FCCC). The DDC-BFP assembly shall be individually factory tested, shipped and installed as a unit.
- G. The DDC-BFP assembly shall be tested at the time of installation. A copy of all test reports shall be submitted to the City DWM.

2.03 REDUCED PRESSURE ZONE BACKFLOW PREVENTER ASSEMBLY

- A. Reduced pressure zone (RPZ) backflow preventer (BFP) assemblies shall be provided in sizes to match that of line service piping or meter size.
- B. The RPZ-BFP assembly shall consist of a pressure differential relief valve located between two positive seating check valves. The relief valve shall function automatically by sensing the pressure differential across the first check valve and discharge the backflow to the atmosphere should the check valve become damaged or fouled. The relief and check valves shall have replaceable seats and the check valves shall be provided with captured springs.
- C. A full port valve in sizes through 2-inches and resilient seated OS&Y gate valves in sizes over 2-inches shall be on the inlet and outlet sides of the assembly, with a union, swivel coupling nut or flanges between the assembly and each valve. Unions and swivel nuts must be integral with the assembly or the valves.
- D. The RPZ assembly shall be provided with three brass valve test cocks fitted with brass or plastic threaded plugs. A fourth test cock shall be provided on the upstream side of the inlet shut off valve. Sizes through 2-inches shall have all test cocks in the vertical position. Relief valve vent ports shall have suitable connections for an air gap. When a meter or other device with bronze strainer, integral or attached, is not immediately upstream of the backflow preventer, a bronze strainer shall be provided between the inlet shut off valve and the RPZ through size 2-inches.
- E. The RPZ assembly and shut off valve bodies shall be cast iron, coated inside and out with an NSF approved, fused epoxy coating and assembled with bolts that are resistant to electrolysis. All RPZ assembly interior and exterior components shall be of materials equal in corrosion resistance to bronze and/or stainless steel to resist electrolysis.
- F. Check valves shall have replaceable seats and shall be accessible by top entry only for maintenance and repair. The detector bypass line on the RPZ-BFP assembly shall be $\frac{3}{4}$ -inch copper and have a bronze detector meter and a $\frac{3}{4}$ -inch DCV-BFP complete with unions and shut off valves.
- G. The RZP-BFP assembly shall be classified or listed by the Underwriters Laboratories,

Factory Mutual Insurance and bear the ASSE seal (ASSE Standard 1049). The RZP-BFP assembly shall also have the approval of and conform to all requirements of the University of Southern California, Foundation for Cross Connection Control (USC-FCCC) and ANSI/AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly.

PART 3 EXECUTION

3.01 TESTING AND INSTALLATION

- A. Backflow prevention assemblies shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the assemblies shall be repaired before they are installed.
- B. DDC-BFP Assembly: The DDC-BFP assembly shall be installed below ground in a vault, as required.
- C. RZP-BFP Assembly:
 - 1. The RZP-BFP assembly shall be individually factory tested, shipped and installed as a unit.
 - 2. The RZP-BFP assembly shall be installed above ground in an insulated enclosure meeting industry and City DWM standards. Enclosure shall be aluminum or fiberglass construction with insulation designed to protect to -30 degrees F. Enclosure shall contain drain openings sized to accommodate the maximum discharge from the RPZ assembly and stainless steel hasps to accept a lock. Enclosure shall be Watts Regulator Company Series Wattsbox or equal.

3.02 SHOP PAINTING

Ferrous surfaces of valves and appurtenances shall receive a coating of rust-inhibitive primer.

+++ END OF SECTION 15150 +++

SECTION 01 11 00
SUMMARY OF WORK
FOR DEMOLITION AND REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Project description
 2. Work by others
 3. Work sequence
 4. Existing site conditions

1.02 PROJECT DESCRIPTION

- A. The Work under this Early Trade Package consists of, in general, the implementation of building demolition and site remediation for development of the Upper Proctor Creek Capacity Relief Facility at the Rodney Cook Senior Park ("Site") in Historic Vine City, Atlanta, Georgia. The Work is required by the City of Atlanta Department of Watershed Management (DWM) ("City DWM").
- B. The Work includes, but is not necessarily limited to, the following items:
1. Compliance with all applicable federal, state and local laws and regulations.
 2. Compliance with the Voluntary Investigation and Remediation Plan (VIRP) as modified in Semi-Annual Status Report #4.
 3. Obtaining all required permits and authorizations from authorities having jurisdiction.
 4. Preparation and submittal of Site-Specific Health and Safety Plan (HASP), Demolition and Remediation Work Plan, and other specified plans and documents prior to commencement of the Work.
 5. Mobilization of supplies, equipment and personnel, including transportation to the Project Site, set-up and maintenance of all equipment and temporary facilities and controls required for project execution.
 6. Installation and maintenance of temporary soil erosion and sediment control measures.
 7. Implementation of health and safety procedures (including required dust control and air monitoring) in compliance with specified requirements, including all applicable regulations of authorities having jurisdiction.
 8. Surveying to lay out the Work, including locations and limits of excavations.

9. Locating and protection of all existing utilities (buried and above grade), structures, trees, and other facilities on the Site not indicated to be removed.
10. Delineation and construction of areas for soil stockpiles, demolition debris, soil stockpiling and stabilization, transport vehicle loading and movement, and other areas required for demolition and remediation activities.
11. Environmental assessment and abatement of all regulated building materials within designated existing buildings to be demolished.
12. Demolition of designated existing residential buildings, including construction waste management, characterization, off-site transport, and disposal of demolition debris.
13. Dewatering of excavations and dewatering of excavated materials for excavation of impacted soils, including (as required) handling, temporary storage, treatment and disposal of dewatering liquids.
14. Excavation and removal of impacted soils at designated locations and to required limits as indicated on the Drawings and specified.
15. On-site temporary stockpiling of excavated impacted soils and stabilization as required for off-site disposal.
16. Confirmation sampling to be conducted along sidewalls at 25 foot intervals for each 8 feet of vertical excavation and along excavation bottom at the rate of one per 1,000 square feet.
17. Sampling and analytical testing required for classification of excavated impacted materials for disposal, and all other specified quality control testing.
18. Off-site transport of excavated impacted soils, and disposal as hazardous or nonhazardous wastes as appropriate to the regulatory status of the materials.
19. Backfilling and grading of excavations in designated areas after completion of removal of impacted soil, including required pre-qualification analytical and physical testing of borrow materials.
20. Decontamination of equipment, transport vehicles, and all other surfaces impacted by demolition and remediation activities.
21. Site cleanup and demobilization.

1.03 WORK BY OTHERS

- A. During the Demolition and Remediation Work, separate contracts will be in place for execution of other work at the Site. The Remediation Contractor shall coordinate with other authorized contractors, engineers, and consultants for execution of other work including, but not limited to, the following:
 - 1. Site demolition (including roadway pavement and subsurface foundations) and removal or abandonment of subsurface utilities.
 - 2. Review of Remediation Contractor's activities by representatives of the City DWM.
 - 3. Observation of demolition and remediation operations and quality assurance activities by representatives of the City DWM.
 - 4. Site development construction.

1.04 WORK SEQUENCE

- A. Detailed sequencing of the Demolition and Remediation Work shall be the responsibility of the Remediation Contractor as long as the requirements of these specifications are met, and the Remediation Contractor's progress is in accordance with the schedule approved by the City DWM.
- B. The general sequence of activities on the Site required for implementation of Demolition and Remediation Work shall be as follows:
 - 1. Power pole relocations by Georgia Power.
 - 2. Roadway demolition.
 - 3. Construction of new combined sewer pipeline around soil remediation area and abandonment of existing combined sewer pipeline through soil remediation area.
 - 4. Relocation, abandonment or removal of all other utilities.
 - 5. Tree removal.
 - 6. Demolition of residential structures.
 - 7. Soil remediation.

1.05 EXISTING SITE CONDITIONS

- A. The property on which the Work will be performed (designated as the "Site") is indicated on the Drawings.
- B. Site surface and subsurface information has been obtained and is available for review by the Remediation Contractor.
- C. Existing Utilities and Other Facilities:
 - 1. Refer to the Drawings for available information on utilities and other facilities.
 - 2. The Contract Documents present provisions regarding available information on existing utilities and other facilities, limitations on

completeness of the information, and requirements for protection, removal and/or abandonment of facilities.

D. Site Environmental Conditions: Refer to the Drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES
FOR DEMOLITION AND REMEDIATION

NOTE: This preliminary version of the Section was based on specifications prepared by AmecFW for a previous remediation project in the Atlanta area, and is provided only as an example for possible use on this project. The Section will need significant input from the Construction Manager and others to present the contract pricing requirements for the Rodney Cook Park project.

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Schedule of Values
 - 2. Applications for Payment
 - 3. Basis of payment
 - 4. Classification of lump sum price items
 - 5. Classification and measurement of unit price items
 - 6. Measurement of quantities
 - 7. Pay items

1.02 SCHEDULE OF VALUES

- A. Prior to commencement of the Work, submit to the City DWM for review a preliminary Schedule of Values for the Project.
- B. The approved Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment, and is not necessarily appropriate for determination of costs for Contract Modifications.
- C. Schedule of Values shall list the value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during the Work. The sum of all values listed in the Schedule of Values shall equal the total Contract Price.
- D. Revise schedule to list approved Change Orders with each Application for Payment.

1.03 APPLICATIONS FOR PAYMENT

- A. Submit Applications for Payment in accordance with the requirements of the Contract Documents.
- B. Substantiating Data for Progress Payments:
 - 1. Submit suitable information with a cover letter identifying project, payment application number, date, and detailed list of enclosures.
 - 2. Evidence of satisfactory payment of subcontractors shall be submitted upon request.

3. City DWM may withhold the whole or part of any payment for the reasons stated under the Contract Documents, including the following:
 - a. The Work does not conform to the Contract Documents, or completed Work has been damaged requiring correction or replacement.
 - b. All required quality control documentation has not been received and approved by City DWM for the portion of the Work claimed in any Application for Payment.

1.04 BASIS OF PAYMENT

- A. The cost of the Work shall be determined as described in the Contract Documents.
- B. Payment includes full compensation for: bonds and insurance; preparation and implementation of Contractor's Site-Specific Health and Safety Plan (HASPs), Demolition and Remediation Work Plan, and other required initial submittals; all required progress submittals; permits; temporary facilities and controls; all required labor, products, tools, equipment, transportation, services and incidentals; performance of surveys to locate and lay out the Work; execution of the Work; analytical and other quality control testing for soil borrow pre-qualification, confirmation sampling and other testing; all specified administrative procedures for Work execution; and overhead and profit.

1.05 CLASSIFICATION OF LUMP SUM PRICE ITEMS

- A. Work items which are not otherwise identified as unit price items in the Bid Form will not be measured for payment. The Work items will be paid for at the Contract lump sum prices for the items identified and the costs summarized on the Bid Form.
- B. Schedule of Values (specified in subsection 1.02) shall identify percent completion milestones for lump sum items. Upon approval by City DWM, judgments of percent completion will be made in reference to the Schedule of Values.

1.06 CLASSIFICATION AND MEASUREMENT OF UNIT PRICE ITEMS

- A. City DWM will monitor the Work and verify the classified portion (Unit Price items) of the Contract Documents. City DWM will be the sole judge as to the determination of the actual quantities and classifications of Unit Price Work.
- B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by City DWM multiplied by the unit price for Work which is incorporated in or made necessary by the Work, unless otherwise indicated in the Contract Documents.
- C. Measurement and calculations of volumes and areas for pay quantities shall be made by the Contractor. It is the Contractor's responsibility to keep proper records of Contractor's on-site personnel, materials and equipment. Support calculations

and drawings shall be provided to City DWM to document all pay quantities. The Contractor shall submit such records on a daily basis for approval or verification. City DWM may verify measurements and quantities.

- D. If the actual Work requires more or fewer quantities than the quantities indicated on the Bid Schedule, provide the required quantities at the unit prices contracted, or as otherwise required in accordance with the Contract Documents. Under no circumstances shall the stated quantities for a particular item of Work be exceeded without prior written approval from City DWM in accordance with the procedures specified in the Contract Documents.

1.07 MEASUREMENT OF QUANTITIES

A. Measurement Devices

- 1. Weigh scales shall meet the applicable requirements of Section 109.01 of the Georgia Department of Transportation "Standard Specifications, Construction of Transportation Systems", 2013 edition. Commodity scales located in Georgia shall be certified prior to use for accuracy and condition by an authorized representative of the Weights and Measures Division of the Georgia Department of Agriculture. Scales located outside Georgia shall be certified in accordance with applicable laws and regulations for the state in which the scales are located. Certification shall have been made within a period of not more than one year prior to date of use for weighing commodity.
- 2. The term "ton" shall mean the short ton consisting of 2,000 pounds.

B. Methods of Measurement

- 1. Measurement by Area: Measured by horizontal dimension using length and width or radius.
- 2. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

1.08 PAY ITEMS

NOTE: To be determined.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION
FOR DEMOLITION AND REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Demolition and Remediation Work Plan
 2. Demolition and Remediation Progress Schedule

1.02 DEMOLITION AND REMEDIATION WORK PLAN

- A. Submit a Demolition and Remediation Work Plan prior to commencement of the Work under this Early Trade Package.
- B. The Plan shall indicate how the demolition and remediation activities are to be implemented and coordinated, and shall include the following at a minimum:
1. Identification of key project personnel and lines of authority, and descriptions of duties of the key personnel, and an organizational chart.
 2. Proposed work days and hours.
 3. Procedures for project communication and coordination.
 4. Diagram(s) of the work site with a layout showing proposed locations of staging areas, office trailers, access to the Site, parking and routing of equipment and personal vehicles, storage of materials, stockpiles, and other Site activities.
 5. Site security measures (coordinate with City DWM site security system)
 6. Remediation Contractor's quality control procedures.
 7. Lists of equipment, systems and materials to be used for the Work.
 8. Description of temporary facilities and utilities required to conduct the Work.
 9. Identification of all permits required to conduct the Work.
 10. Staging of operations, including sequencing of the Work, impact of Work on streets and properties, required timing and location of street closures if any, and routing of haul vehicles and construction equipment.
 11. Abatement Work Plans.
 12. Building Demolition Work Plan (as specified in Section 02 41 17).
 13. Soil Stabilization Work Plan (as specified in Section 02 61 15).

14. Dewatering Plan (as specified in Section 31 23 19).
15. Description of methods and locations for shoring or sloping of excavations, including engineering calculations as appropriate.
16. Proposed methods and operations for removal, handling, treatment (if required) and disposal of excavated impacted soils.
17. Procedures for controlling dust and odor emissions.
18. Procedures for providing required notifications and coordination with the City DWM and other local jurisdictions as required for performance of the Work.
19. Name, location and regulatory status of proposed disposal facilities for facility abatement, demolition debris and excavated materials.
20. Name of primary trucking company and back-up trucking company for off-site transportation of facility abatement, demolition debris, and excavated materials.
21. Information on proposed truck haul routes on and off-site.
22. Name of primary borrow source to be requested for prequalification, and name of a trucking company and one back-up for transportation of clean backfill to the Site.

1.03 DEMOLITION AND REMEDIATION PROGRESS SCHEDULE

- A. Prepare and submit initial Demolition and Remediation Progress Schedule prior to commencement of the Work under this Early Trade Package. Coordinate with Section 01350 - Project Document Tracking and Control System.
- B. Prepare the Demolition and Remediation Progress Schedule in accordance with the requirements of the City DWM. The Schedule is to be used as the baseline/target schedule.
- C. Show complete sequence of remediation by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, level of effort by man-hours, and duration. Identify all Critical Path elements.
- D. The Demolition and Remediation Progress Schedule shall be in accordance with the required work sequence and completion dates required in the Contract Documents.
- E. The Demolition and Remediation Progress Schedule shall be revised as required to indicate anticipated and actual durations and sequence of activities. Copies of revised Schedules shall be provided to the **City DWM** as required for review and comment.

- F. Indicate estimated percentage of completion for each item of Work at each submission. Schedule updates shall present baseline/target bars for individual remediation activities directly beneath current timeline bars for comparison purposes.

1.06 PROJECT COORDINATION AND SCHEDULING

- A. Coordinate scheduling, submittals, and activities of the Early Trade Package with other Project work presented in the various sections of the Specifications to assure efficient and orderly sequencing of the Work.
- B. Remediation Contractor agrees to complete the Work so as to accommodate the completion of other activities on the Site and to provide necessary barricades and other facilities to protect the Work in compliance with all applicable health and safety regulations.
- C. Remediation Contractor shall initiate and perform the defined Scope of Work in accordance with the Demolition and Remediation Project Schedule, and shall proceed and complete performance of the Work promptly, diligently and in such a manner and sequence in coordination with the work of other contractors in order to permit completion of the total Project within the time required by the overall Project Schedule.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 29
HEALTH AND SAFETY
FOR DEMOLITION AND REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Submittals
 2. Contractor's responsibility for health and safety
 3. Site-Specific Health and Safety Plan
 4. Air monitoring
 5. Delineation of work zones
 6. Personal protective equipment
 7. Site Health and Safety Officer

1.02 SUBMITTALS

- A. Prepare and submit Site-Specific Health and Safety Plan (HASP) to Amec Foster Wheeler (Engineer) and the City DWM for review prior to commencement of Site remediation and demolition activities on the Site. The Remediation Contractor's HASP shall conform to requirements of subsection 1.04 of this Section.
- B. For site remediation and demolition activities, submit the following written communications to the City DWM (at a minimum) during performance of the Work:
1. Immediate notifications regarding any and all health and safety incidents.
 2. Immediate notification of any and all hazards that Remediation Contractor discovers on the Site other than those identified in the Contract Documents.
- C. Refer to other applicable specification section(s) for specific health and safety submittal requirements for hazardous materials assessment and abatement activities in buildings to be demolished. If required, prepare separate Site-Specific HASPs for these activities in conformance with all applicable regulations.

1.03 CONTRACTOR'S RESPONSIBILITY FOR HEALTH AND SAFETY

- A. Remediation Contractor shall be responsible for the health and safety of the general public and Remediation Contractor's and subcontractors' employees who are present on the Site. Remediation Contractor will be responsible for Site access control measures and perimeter air monitoring in order to protect the public.
- B. Remediation Contractor shall be responsible for emergency response planning and notification, and for actual response to any and all emergencies that may occur during the course of the Work, including emergencies occurring when Remediation Contractor is not present at the Site.

- C. Utilize the services of a Certified Industrial Hygienist (CIH) or Certified Safety Professional (CSP), as appropriate, to develop and implement the HASP. The HASP shall define the Remediation Contractor's responsibility to conduct initial site-specific training, and provide support for all health and safety activities as needed, including personnel medical surveillance, air monitoring, and the upgrading or downgrading of the level of personnel protection.
- D. Communicate regularly with Engineer and City DWM regarding health and safety issues for safe conduct of their duties, but such communication shall not imply any duty or responsibility on the part of Engineer and City DWM with regard to Remediation Contractor's health and safety. Engineer's and City DWM's responsibilities and duties with regard to health and safety shall be limited to employees of Engineer and City DWM. Remediation Contractor shall have responsibility and duty to Engineer and City DWM to communicate health and safety issues accurately and in a timely manner to allow Engineer and City DWM to take appropriate actions to protect their employees on the Site.
- E. Remediation Contractor's duties and responsibilities to other project entities (including Prime Contractor and the City DWM) regarding health and safety shall be in accordance with the Contract Documents and applicable laws and regulations.
- F. Comply with all applicable local, state, and federal health and safety standards and guidelines implemented through, but not limited to, the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the American Conference of Governmental Industrial Hygienists (ACGIH), and United States Environmental Protection Agency (USEPA). Where these are in conflict, the most stringent requirement shall be followed.
- G. Remediation Contractor shall immediately notify the City DWM in writing of any hazard that Remediation Contractor discovers or observes on the Site, other than that identified in the Contract Documents, and describe corrective measures planned or taken to eliminate or minimize such hazard.
- H. Refer to other applicable sections for specific health and safety requirements which must be implemented during hazardous materials assessment and abatement activities in buildings to be demolished.
- I. Remediation Contractor shall comply with all Field Orders or Work Change Directives issued by the City DWM for temporary stoppage of the Work or change in procedures of the Work in response to unacceptable release of airborne particulates detected by the ambient air monitoring program.

1.04 SITE-SPECIFIC HEALTH AND SAFETY PLAN

- A. Remediation Contractor shall prepare Site-Specific Health and Safety Plan(s) (HASP) in accordance with applicable local, state and federal regulations for all remediation and demolition work on the Site in accordance with 29 CFR 1910.120, including personnel medical surveillance for blood-lead based on the anticipated length of the remedial action, 1910.1025, 1926.62, 1910.1001 and 1926.1101,

related to lead remediation in soil, lead assessment and abatement in structures, and asbestos surveys and abatement.

- B. In the preparation of the Remediation Contractor's HASP, Remediation Contractor shall review the Engineer's HASP (copy to be provided to Contractor), and shall include, at a minimum, the level of protection included in the Engineer's HASP.
- C. The Remediation Contractor's HASP will be reviewed and commented on, but will not be approved by the City DWM or Engineer.
- D. The HASP shall cover all activities associated with the specified Work, including but not limited to the following:
 - 1. Hazardous materials assessment of buildings to be demolished.
 - 2. Abatement of asbestos and other regulated materials if applicable (include in separate HAZWOPER HASP as needed).
 - 3. Transportation and disposal of hazardous materials from building abatement (include in Abatement Plan).
 - 4. Demolition of buildings.
 - 5. Handling and off-site disposal of demolition debris.
 - 6. Excavation, handling and stockpiling of impacted soils.
 - 7. Site wide and task specific dust, lead particulate, and respirable silica control measures and monitoring in accordance with the latest federal standards.
 - 8. Dewatering operations (including handling, treatment and discharge of disposal of liquids).
 - 9. On-site stabilization of excavated materials for transport.
 - 10. Loading and offsite hauling of excavated materials for disposal.
 - 11. Transportation and disposal of excavated materials.
- E. Implement, maintain and enforce the procedures in the HASPs at the appropriate time prior to and during the Work. The following shall be included in the Remediation Contractor's HASPs (as applicable):
 - 1. Names of key personnel and alternates responsible for health and safety, including a Site Health and Safety Officer (specified in subsection 1.08).
 - 2. Medical surveillance requirements in accordance with applicable OSHA regulations.
 - 3. Copies of current OSHA health and safety training certificates and medical certifications for employees who will be working on the Site.
 - 4. Site description and evaluation.
 - 5. Analysis of specific work tasks and the associated hazards and protective measures.
 - 6. A description of personal protective equipment (PPE) to be used by employees for each of the Site tasks and operations being conducted.
 - 7. A description of engineering controls used to reduce the hazards of equipment operation and exposure to Site hazardous chemicals and substances.

8. Corrective actions and upgrading of personnel protection based on monitoring of air, personnel, and environmental sampling, with specific action levels identified.
9. Site control measures in accordance with the control program required in 29 CFR 1910 and 29 CFR 1926.
10. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used by the Remediation Contractor for the purpose of employee safety, including methods of maintenance and calibration of monitoring and sampling equipment. (Refer to subsection 1.05.)
11. Site sanitation procedures.
12. Decontamination procedures for equipment, personnel, vehicles, and tools.
13. Proposed location and construction of decontamination facilities.
14. Procedures for the collection, treatment, and disposal of decontamination water and residuals.
15. Hazard Communications Program and SDS requirements.
16. An emergency response plan meeting federal, state, and local requirements for safe and effective responses to emergencies, including the necessary PPE and other equipment.
17. Explanation of potential emergencies and contingency plan of action, including description of the route to the nearest appropriate hospital, hospital route map, and posting of emergency telephone numbers at the Site.
18. Logs, reports, and recordkeeping.

1.05 AIR MONITORING

- A. Air monitoring shall be conducted for all Site remediation and demolition activities as specified in this subsection. Refer to other applicable sections for specific air monitoring requirements which must be implemented during abatement activities within buildings to be demolished.
- B. An ambient air monitoring program shall be conducted by the Remediation Contractor for all Site remediation and demolition activities in accordance with applicable regulations.
- C. The purpose of the ambient air monitoring program is to detect and mitigate potential releases of: lead-containing dust particles and other constituents of concern during excavation and handling of site soils; and hazardous air-borne particulates during building abatement and demolition activities. The program shall include perimeter monitoring and real time air sampling to monitor airborne dust and respirable silica particulates on the property.
- D. The Remediation Contractor's safety professional shall design, develop and implement the air monitoring program. The program shall be included as part of the Remediation Contractor's HASP and shall conform to all applicable state and federal regulations. The safety professional shall be responsible for establishing: air monitoring strategies and protocols using real-time instrumentation; and implementing appropriate sampling and analytical procedures for time-weighted-average (TWA) monitoring.

- E. Furnish and maintain appropriate real-time air monitoring equipment and properly equipped monitoring stations for perimeter TWA sampling in accordance with applicable regulations. The Remediation Contractor shall also provide personal air sampling pumps and appropriate sampling media for conducting required on-site TWA personnel sampling. Samples shall be analyzed using appropriate analytical methods.
- F. Information gathered during the air monitoring program shall be used: to evaluate and adjust health and safety measures to be implemented during the Site remediation and demolition work; and to assess potential off-site migration of dust and other air-borne particulates so that control measures and contingency plans may be adjusted.

1.06 DELINEATION OF WORK ZONES

- A. Prior to implementation of Site remediation and demolition work activities, establish the boundaries of the work areas as approved by the City DWM and in accordance with applicable regulations. These areas shall include Exclusion Zone(s), Contamination Reduction Zone(s), and Support Zone(s).

1.07 PERSONAL PROTECTIVE EQUIPMENT

- A. Furnish and maintain materials and equipment for the health and safety of Remediation Contractor's and subcontractors' employees. Provide all required health and safety equipment, first aid equipment, tools, monitoring equipment, PPE, decontamination equipment, and ancillary equipment and methods required to ensure worker health and safety and to comply with all applicable regulations.
- B. Engineer and City DWM will furnish PPE for their employees but will use Remediation Contractor's decontamination areas and materials.

1.08 SITE HEALTH AND SAFETY OFFICER

- A. Remediation Contractor shall designate a Site Health and Safety Officer (SHSO). The SHSO shall assist and represent the CIH in the continued implementation and enforcement of the HASP. The SHSO shall be assigned to the Site on a full-time basis and shall be either the Remediation Contractor's employee or a subcontractor who reports to the Remediation Contractor and the CIH in matters pertaining to Site health and safety. The name, qualifications and work experience of the SHSO shall be included in the HASP.
- B. Remediation Contractor shall hold safety meetings for all workers on the Site, a minimum of once per day for each work shift (prior to initiation of on-site field activities), to address health and safety issues, changing Site conditions, activities, and personnel. Hold additional safety meetings at the start of each major task and for changes in Site conditions that affect personnel safety.

- C. In the event of an unmanaged health and/or safety risk as determined by the SHSO, Remediation Contractor shall not proceed with the Work until a method for managing the risk has been determined in consultation with the City DWM, and implemented. Any health or safety risk resulting in a stoppage of work shall be reported immediately to the City DWM in writing.
- D. The designated SHSO shall not be replaced without written notice to, and approval by, the City DWM. Written notice shall be submitted a minimum of one week prior to the proposed change.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS
FOR DEMOLITION AND REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Regulatory requirements
 2. References
 3. Submittals
 4. Source quality control testing
 5. Quality assurance and quality control services
 6. Qualifications and duties of QC firms
 7. Limits on authority of QC firms
 8. Remediation Contractor's responsibilities

1.02 REGULATORY REQUIREMENTS

- A. Comply with all applicable local, state and federal standards and regulations, including but not limited to:
1. Occupational Safety and Health Administration (OSHA)
 2. National Institute for Occupational Safety and Health (NIOSH)
 3. American Conference of Governmental Industrial Hygienists (ACGIH)
 4. United States Environmental Protection Agency (USEPA)
 5. State of Georgia EPD Asbestos and Demolition Notification Requirements
 6. USEPA Asbestos NESHAP Regulations
 7. Industry standards
 8. Permit requirements

1.03 REFERENCES

- A. Conform to latest edition of reference industry standards and regulations as of date of the Contract Documents or date otherwise specified in individual specification sections.
- B. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 SUBMITTALS

- A. Prior to start of the Work, submit qualifications information for each testing firm and laboratory (QC firm) proposed to be retained for specified analytical and physical testing of materials. Submit the following information to the City DWM for review and approval.
1. Name, address, and telephone number of each QC firm.
 2. Name of responsible officer for each QC firm.
 3. Documentation that each QC firm complies with the qualifications specified in subsection 1.08.

- B. Remediation Contractor shall submit copies of the QC firms' inspection and test reports to the City DWM within three working days after obtaining results of each inspection and test. Reports shall include, as applicable:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector or lab technician.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product or material.
 - 6. Location in the project.
 - 7. Type of inspection or test.
 - 8. Date sample received in laboratory, and name of person receiving sample.
 - 9. Date of test.
 - 10. Results of tests.
 - 11. Signature of appropriate specialist on laboratory report certifying accuracy of data.

1.05 SOURCE QUALITY CONTROL TESTING

- A. Materials forming the Work under this Contract (including imported soil backfill material) are subject to pre-qualification testing prior to delivery to the Site as specified in Section 31 23 43.
- B. Materials generated by the Work (including excavated impacted materials to be disposed offsite) are subject to testing in accordance with applicable regulations as specified in applicable sections.
- C. Provide statements or certificates from the suppliers as specified.

1.06 QUALITY ASSURANCE AND QUALITY CONTROL SERVICES

- A. The requirements of this Section shall be considered as supplementary to the provisions of Section 01400 – Quality Assurance/Quality Control. The procedures to be followed by the Remediation Contractor during demolition and remediation shall be coordinated with the project overall quality control program as approved by the City DWM.
- B. The City DWM will provide monitoring of the demolition and remediation work and other duties for Quality Assurance.
- C. Remediation Contractor shall retain the services of approved independent QC firms to perform specified inspections, physical and analytical testing, and other required testing of the Work. Testing to be performed includes (as specified in applicable sections): analytical testing of excavated impacted materials for offsite disposal; pre-qualification testing of borrow materials; and soil compaction testing of backfilled areas.
- D. Analytical testing laboratory(ies) retained by the Remediation Contractor shall also perform specified confirmation sampling and analyses at limits of impacted soil removal as specified in Section 02 61 14.

- E. Remediation Contractor shall allow sufficient time in the Demolition and Remediation Progress Schedule for confirmation sampling and testing, evaluation, and reporting of test results. Remediation Contractor shall give particular attention to this where results/approvals will be required prior to continuing with the Work.
- F. If Remediation Contractor elects to continue with work in advance of receipt of test results and the City DWM approval (as applicable), it shall be understood that it shall be entirely at Remediation Contractor's risk. The City DWM will not be responsible for consequential delays attributable to failing test results or retesting requirements.

1.07 QUALIFICATIONS AND DUTIES OF QC FIRMS

- A. Each testing firm and laboratory shall be an approved organization, meeting the qualifications dictated by applicable standards and regulations and authorities having jurisdiction, with documented laboratory experience in analytical or material testing (as applicable) of the types required for this Project.
- B. All QC firms shall maintain a full-time registered engineer or other specialist, as needed, on staff to review services and test results. QC firms shall comply with the requirements for quality assurance of applicable regulatory agencies and the latest industry standards.

1.08 LIMITS ON AUTHORITY OF QC FIRMS

- A. QC firms shall not release, revoke, alter, or enlarge on requirements of the Contract Documents.
- B. QC firms shall not approve or accept any portion of the Work, and shall not assume any duties of the Remediation Contractor or City DWM.

1.09 REMEDIATION CONTRACTOR'S RESPONSIBILITIES

- A. Furnish incidental labor and facilities:
 - 1. To provide access to work to be tested;
 - 2. To obtain and handle samples at the Site or at the source of products to be tested;
 - 3. To facilitate inspections and tests; and
 - 4. For storage and curing of test samples as required.
- B. Coordinate with the City DWM sufficiently in advance of demolition and remediation activities to allow for assignment of personnel for observation of the Work and other duties to be performed by authorized representatives of the parties.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 57 00
TEMPORARY CONTROLS
FOR DEMOLITION AND REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Submittals
 2. Mobilization
 3. Temporary utilities
 4. Temporary sanitation facilities
 5. Protection of existing utilities
 6. Temporary barriers, signage and markers
 7. Site access and parking
 8. Site housekeeping
 9. Noise control
 10. Surface water control
 11. Control of pollutants
 12. Dust control

1.02 SUBMITTALS

- A. The following submittals referenced in this Section shall be submitted (as applicable) to the City DWM for review:
1. Spill Prevention, Control and Countermeasures Plan (see subsection 1.12)

1.03 MOBILIZATION

- A. Remediation Contractor shall mobilize to the Site and be prepared to initiate the remediation activities within the time limit determined by the City DWM.
- B. Mobilization shall not proceed until the Remediation Contractor has:
1. Obtained all permits, licenses and OSHA training certificates necessary to perform the Work, where required.
 2. Submitted all required initial submittals as specified.
- C. Mobilization includes, but is not necessarily limited to: transportation of personnel, equipment, and operating supplies to the site; and other preparatory work at the Site.
- D. All equipment mobilized to the Site shall be inspected by the Remediation Contractor to verify the condition of the equipment to ensure that it is free of obvious mechanical defects and safety deficiencies.

1.04 TEMPORARY UTILITIES

- A. Conform to the requirements of Section 01510 – Temporary Facilities.

1.05 TEMPORARY SANITATION FACILITIES

- A. In addition to the requirements of Section 01510, provide and maintain (as applicable) temporary toilets, washing facilities, and other sanitation facilities on the Site in accordance with 29 CFR 1910.120(n), 29 CFR 1926.51, and all other applicable laws and regulations.

1.06 PROTECTION OF EXISTING UTILITIES

- A. Protect all existing active and inactive utilities from damage during the Work unless indicated to be removed or abandoned on the Drawings. If damaged, the utilities shall be repaired as approved by the City DWM.
- B. Contact and cooperate with the City DWM and utility companies to locate utilities within defined the limits of the Site prior to beginning the Work. The Remediation Contractor will only be responsible for locating and protection (or removal or abandonment) of utilities within the limits of building demolition and site remediation as designated on the Drawings. Coordinate with utility locating, protection, abandonment or removal to be performed by others on the Site.
- C. Comply with the requirements of the “Georgia Utility Facility Protection Act” (Chapter 9 of Title 25 of the Official Code of Georgia Annotated) for protection of underground utilities, including the requirement to give not less than 48 hours notice to the Utilities Protection Center of Georgia (Georgia 811).
- D. Comply with the requirements of the utility owner and the “High-voltage Safety Act” (Chapter 3 of Title 46 of the Official Code of Georgia Annotated) for protection of overhead high-voltage lines, including the requirement to give notice to the Utilities Protection Center of Georgia (Georgia 811) at least 72 hours prior to commencing work in the vicinity of the high-voltage lines.

1.07 TEMPORARY BARRIERS, SIGNAGE AND MARKERS

- A. Conform to the requirements of Section 01540 – Security and Safety, and as specified below.
- B. For all demolition and Site remediation work, provide barriers, signs and markers to protect demolition and Site remediation work areas in conformance with all applicable local requirements and health and safety laws and regulations. Install fencing as specified in the following paragraphs. Maintain the temporary facilities on a daily basis and replace damaged materials until all demolition and site remediation has been completed and accepted.
- C. Remediation Contractor shall install temporary chain link security fencing around all demolition and remediation work areas on the Site to prevent unauthorized entry and protect the public. Special emphasis shall be taken to provide security fencing, signage and other markers at limits of all work areas adjacent to roadway rights-of-way and other property boundaries.

- D. Fencing shall consist of, at a minimum, 6-foot height, commercial-grade, and shall be anti-climb (using small mesh size for fence fabric). Fencing shall be constructed with required fencing materials (including posts and framework) and installation procedures to meet applicable industry standards for wind load and other loading criteria. If required by the City of Atlanta, install privacy screen fabric or slats on the fencing. Provide vehicular and pedestrian gates with locks as needed and as approved by the City DWM. Maintain fencing on a daily basis and replace or repair damaged materials for full duration of the Remediation Work.

1.08 SITE ACCESS AND PARKING

- A. Remediation Contractor's vehicles shall enter and exit the Site only at the locations designated on the Drawings. Conform to the requirements of Section 01540.
- B. Remediation Contractor parking and laydown areas shall occur only at locations designated or approved by the City DWM. When Site space is not adequate, provide additional off-site parking. Vehicles shall not be parked in any locations where they impede traffic or access by emergency vehicles and other Site usage.
- C. Repair existing off-site roads damaged by operation of remediation equipment as determined by the City DWM in compliance with requirements of the authority having jurisdiction.

1.09 SITE HOUSEKEEPING

- A. Maintain a high standard of Site housekeeping and implement all measures necessary to manage the impact of the Work on public roads and rights-of-way or adjacent properties as indicated on the Drawings (including the Erosion, Sedimentation and Pollution Control ES&PC Plan) and in accordance with the Specifications.

1.10 NOISE CONTROL

- A. Remediation Contractor is responsible for controlling noise levels by utilizing appropriate noise control on equipment and by complying with required work hour restrictions and other limitations imposed by authorities having jurisdiction.
- B. Remediation Contractor's vehicles and equipment shall have appropriate noise reduction and protection devices that conform to the latest OSHA standards (including 29 CFR 1926.52), and all other applicable laws and regulations.
- C. Noise mitigation measures shall include, but shall not be limited to, utilizing noise control devices, limiting night work hours for certain activities, and scheduling and controlling traffic.
- D. Coordinate with the City DWM to revise work procedures and hours as needed to address noise complaints, if received, while implementing methods to preserve the project schedule without additional cost to the Project. Remediation Contractor shall comply with all requirements of the City of Atlanta for work hours.

1.11 SURFACE WATER CONTROL

- A. Provide methods to control surface water to prevent damage to the Work, the Site, and adjoining properties as indicated on the Drawings and specified in Section 31 23 19.

1.12 CONTROL OF POLLUTANTS

- A. If fuel or other petroleum-based products will be stored on-site to support equipment fleet, prepare and implement a Spill Prevention, Control and Countermeasures Plan (SPCC Plan) in accordance with the provisions of 40 CFR Part 112, Oil Pollution Prevention. The SPCC Plan shall be submitted to the City DWM for review.
- B. Prevent disposal of wastes, effluents, chemicals, or other such substances into sanitary or storm sewers discharging off-site without treatment in accordance with permits obtained by the Remediation Contractor.
- C. Fueling of equipment shall be performed away from storm drain inlets. If above-ground fuel storage tanks (ASTs) are present on-site, the ASTs shall be stored in an approved bermed and lined containment areas.
- D. Provide systems for control of atmospheric pollutants. Prevent smoke or other emissions from interfering with other operations on the Site and impacting the environment (including adjacent properties). Prevent toxic concentrations of chemicals, and prevent harmful dispersal of pollutants into the atmosphere. Provide air monitoring as specified in Section 01 35 29.
- E. Remediation Contractor's equipment used during the Work shall conform to all applicable laws and regulations.

1.13 DUST CONTROL

- A. During demolition and Site remediation work, the Remediation Contractor shall (at a minimum) implement, monitor and maintain best management practices (BMPs) for erosion and sedimentation control, including control of airborne transport of sediment (dust carried by wind) as required by the Erosion, Sedimentation and Pollution Control Plan (ESPC Plan).
- B. The Remediation Contractor shall also control potential releases of dust (airborne particulates) during excavation and handling of Site soils, facility abatement activities, building demolition, and handling of demolition debris in accordance with all applicable laws and regulations as specified in Section 01 35 29.
- C. Control release of airborne particulates from demolition and remediation activities at all times, including weekends, holidays and hours when the Work is not in progress.

- D. Maintain excavations, stockpiles, and other areas within the Work areas free from particulates which would cause the air pollution standards to be exceeded or cause a hazard or nuisance.
- E. Provide all labor, materials and equipment (including water trucks and dust suppressant) as needed to limit visible dust generation on the Site during the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02 26 00
REGULATED BUILDING MATERIAL ASSESSMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Work of this Section includes performing facility assessments to identify Regulated Building Materials (RBM) to be removed and disposed of or recycled prior to commencement of demolition of structures. Potential RBM could include but may not be limited to materials, equipment, or components containing asbestos, lead, polychlorinated biphenyl, mercury, refrigerants and chlorofluorocarbons, and stored materials including solvents, paints, batteries, pressurized gas cylinders, aerosol cans, or flammable materials.
- B. Related Sections:
 - 1. Section 02 41 17 – Building Demolition
 - 2. Section 02 80 13 – Regulated Building Material Removal and Disposal

1.02 REFERENCES

- A. U.S. Environmental Protection Agency (EPA) Regulations for Asbestos (Code of Federal Regulations Title 40, Part 61, Subparts A).
- B. U.S. EPA National Emissions Standards for Hazardous Air Pollutants (Code of Federal Regulations Title 40, Part 61).
- C. US EPA Asbestos Hazard Emergency Response Act (AHERA) regulations (Code of Federal Regulations Title 40 Part 763, Subpart E).
- D. U.S. EPA Office of Pesticide and Toxic Substances Guidance Document, "Guidance for Controlling Friable Asbestos Containing Materials in Buildings", EPA 56015 85 024, June, 1985.
- E. U.S. EPA Toxicity Characteristic Leaching Procedure (TCLP) Method 1311, SW-846.
- F. U.S. EPA Protection of Stratospheric Ozone (Code of Federal Regulations 40 CFR, Part 82).
- G. U.S. EPA Regulations Identifying Hazardous Waste (Code of Federal Regulations 40 CFR, Part 261).
- H. U.S. EPA Regulations for Hazardous Waste Generators (Code of Federal Regulations 40 CFR, Part 262).
- I. U.S. EPA Regulations for Hazardous Waste Transporters (Code of Federal Regulations 40 CFR, Part 263).
- J. U.S. EPA Universal Waste Rule, Thermostat Ampoule Removal Standards (Code of Federal Regulations 40 CFR, Parts 273.13/.33).

- K. U.S. OSHA Asbestos Regulations (Asbestos Standard for Construction, (29 Code of Federal Regulations 1926.1101).
- L. U.S. OSHA Asbestos Regulations for General Industry (29 Code of Federal Regulations 1910.1200, HAZCOM and 1910.120, HAZWOPER)
- M. U.S. OSHA Asbestos Regulations for Respiratory Protection (Code of Federal Regulations 1910.134).
- N. 29 CFR 1926 OSHA Standards for Construction Industry (29 Code of Federal Regulations 1926.59, HAZCOM)
- O. U.S. Department of Transportation, Hazardous Substances: Final Rule (Code of Federal Regulations Title 49 Parts 171 through 179).
- P. State of Georgia Asbestos Safety Act – Act 12, Chapter 12 of the Official Code of Georgia Annotated.
- Q. Rules of the Georgia Department of Natural Resources, Environmental Protection Division (EPD), Chapter 391-3-4, Asbestos Removal and Encapsulation Regulations.
- R. Rules of the Georgia Department of Natural Resources, Environmental Protection Division, Chapter 391-3-1, Rules for Air Quality Control.
- S. State of Georgia – Rules of the Asbestos Licensing Board, Chapter 52-1 through 52-7.
- T. State of Georgia – Solid Waste Management Regulations, Chapter 391-2-4.
- U. State of Georgia – Air Quality Control Act, Section 12-9-1
- V. State of Georgia – Solid Waste Management Act, Act 1486, Section 1531
- W. State, county, and city codes and ordinances as applicable.
- X. ANSI Publications: Z88.2-80; Practices for Respiratory Protection.
- Y. NIOSH: 81-123; Occupational Health Guidelines for Chemical Hazards.

1.03 DESCRIPTION OF WORK

- A. The Contractor is responsible for the development of RBM Assessment Work Plan to describe the means and methods to be used to locate and identify RBM present in the structures to be demolished as specified in Section 02 41 17.
- B. The Contractor is responsible for performing building assessments, sampling, and analysis necessary to identify, locate, and quantify RBM to be removed as specified in Section 02 80 13.

- C. Work of this Section shall be performed in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations.

1.04 SUBMITTALS

A. Pre-Assessment Submittals

1. Prepare and submit a detailed Regulated Building Materials (RBM) Assessment Work Plan describing the procedures the Contractor shall follow to implement the activities of this Section. The RBM Work Plan shall be developed in accordance with relevant and appropriate Federal, state, and local regulations. The RBM Assessment Work Plan shall include the following:
 - a. Description of methods, sequence, and process to be used to locate, identify, and quantify regulated RBM.
 - b. Sampling Plan describing the materials that to be sampled, methodology for determining sample locations, and sample collection methods.
 - c. Analysis Plan describing the analytical methods to be used to test and analyze samples.
 - d. Permits, notifications, licenses, accreditations, and certifications required for individuals, firms, or laboratories that will perform work associated with the RBM assessments.
 - e. Safety Plan.
 - f. A list of the licenses, accreditations, certifications, and training required for individuals, subcontractors, or laboratories that will perform work associated with the RBM assessments.
2. Pre-Assessment submittals shall be provided to City DWM no later than 10 calendar-days prior to commencement of site activities.
3. RBM Assessment Work Plan will be reviewed and approved by City DWM prior to commencement of building assessment activities. Work Plans that are evaluated to be non-compliant with current US EPA, US OSHA, NESHAP, Georgia EPD regulations, and these specifications will not be approved and the Contractor shall revise and resubmit.

B. Assessment Submittals

1. Provide a written report of findings of the RBM assessment. Report shall include the following
 - a. List of the suspect RBM materials, equipment, components observed during the assessment.

- b. List of the materials, equipment, components sampled during the assessment.
 - c. A summary of the results of the laboratory analyses.
 - d. List of the RBM identified by the assessment including location and quantity.
 - e. A copy of required licenses, accreditations, certifications, and training of the individuals, subcontractors, or laboratories that performed the work associated with the RBM assessments.
2. The RBM assessment report of findings shall be provided to City DWM no later than 30 calendar-days following completion of Site assessment of this Section and no fewer than 15 calendar-days before Pre-Removal Submittals specified in Section 02 80 13 are submitted.

1.04 QUALITY ASSURANCE

- A. Contractor shall conform to applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations related to RBM removal, handling, storage, disposal, and recycling.
- B. Individuals performing the RBM assessments shall be experienced with similar work and licensed, certified, or accredited in accordance with appropriate US EPA, US OSHA, NESHAP, and Georgia EPD regulations.
- C. Laboratories performing analysis of RBM samples shall be accredited in accordance with appropriate US EPA, US OSHA, NESHAP, and Georgia EPD regulations relative to the RBM constituents analyzed.

1.05 PROJECT CONDITIONS

- A. Work with the City DWM to coordinate schedule for access to perform facility assessment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.03 SITE ASSESSMENTS

- A. Perform Site assessments in accordance with approved RBM Assessment Work Plan necessary to locate, identify, and quantify RBM present in structures to be demolished.
- B. Assessments shall be performed in accordance with US EPA, US OSHA, NESHAP, and Georgia EPD applicable regulations as required prior to demolition and disposal of structures.

- C. Selective demolition shall be performed to access potentially hidden or enclosed RBM.
- D. Prepare and submit a report of RBM Assessment.

END OF SECTION

SECTION 02 41 17
BUILDING DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes demolition and removal of aboveground structures associated with four residential units located northwest of the intersection of Tyler Street and Walnut Street, including all utilities, foundations, and other improvements on the Site as indicated on the Drawings. Assessments and abatement of Regulated Building Materials shall be completed prior to commencement of demolition of structures.
- B. Related Sections:
 - 1. Section 01540 – Security and Safety
 - 2. Section 02125 – Temporary and Permanent Erosion and Sedimentation Control
 - 3. Section 02 26 00 – Regulated Building Material Assessment
 - 4. Section 02 80 13 – Regulated Building Material Removal and Disposal
 - 5. Section 31 23 43 – Backfilling and Grading for Remediation

1.02 REFERENCES

- A. Code of Federal Regulations Publications (CFR)
 - 1. United States Department of Labor
 - a. 29 CFR 1926, Safety and Health Regulations for Construction

1.03 SUBMITTALS

- A. Prepare and submit a Building Demolition Work Plan describing the procedures the Remediation Contractor proposes to follow to implement the demolition activities of this Contract. The Demolition Work Plan shall be developed in coordination with all relevant and appropriate Federal, state, and local regulations. The Demolition Work Plan shall include, but not be limited to, the following
 - 1. Description of methods, sequence and equipment to be used for demolition.
 - 2. Procedures for handling, loading, and disposal/recycling of all materials; including metals, concrete, and debris, including proposed disposal facilities.
 - 3. Procedures to prevent unauthorized access to the Site and protect pedestrian and vehicular traffic (coordinate with requirements of Section 01540).
 - 4. Procedures for site restoration, including grading and seeding disturbed areas

- B. Submit written certification of proper transport and final disposal of demolition materials to a permitted disposal facility.
- C. Submit State of Georgia Demolition Notification for review by Owner for review prior to filing with the EPD.

1.04 QUALITY ASSURANCE

- A. Conform to all applicable local, state, and federal regulations (including 29 CFR 1926, Part T – Demolition) related to operation of equipment and tools, protection of persons and property, environmental controls and other requirements.
- B. Utility demolition work shall comply with all applicable codes and standards, including requirements of the utility owners.
- C. Obtain all necessary permits and licenses to accomplish the removal, transportation and disposal of all demolition materials. Furnish a copy of all applicable abatement and demolition notifications, licenses and permits to the City DWM before starting any work at the Site.

1.05 PROJECT CONDITIONS

- A. Work with the City DWM to coordinate schedule for abatement and demolition work.
- B. During demolition, use all procedures necessary to assure that no portion of the structures, either that to be removed or to remain, become a hazard to persons by instability or other condition.
- C. Notify all local, state, and federal agencies having jurisdiction and complete all necessary forms required for demolition and disposal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

- A. By careful study of the Drawings and these Specifications, and coordination with the City DWM, determine the location and extent of demolition to be performed.
- B. Coordinate work of Sections 02 26 00 and 02 80 13 so that Work specified in those sections is completed prior to commencement of site demolition activities specified in this Section.
- C. Barricade the work areas and provide other controls for protection of personnel. Maintain barricades, signs and other required controls during demolition work.
- D. Protect and divert pedestrian and vehicular traffic when needed for compliance with the requirements of City of Atlanta and other authorities having jurisdiction.

- E. Notify affected utility companies before starting work and comply with utility's requirements. For building demolition, shut off, terminate, or cap utilities at the limits of demolition and protect exterior site utilities to remain in place in accordance with the requirements of the utility company and the City DWM. Survey and mark locations of all utility termination points for future reference.

3.02 DEMOLITION OF BUILDINGS

- A. Demolish and remove designated existing buildings down to grade. Structural elements to be demolished include concrete and brick walls, building superstructure, exterior wall enclosures, roofing, interior construction, aboveground building services (utilities), equipment, furnishings, aboveground foundations and all other building and structural components.
- B. Excavate, demolish and remove foundation walls and footings.

3.03 DISPOSAL OF REMOVED MATERIALS

- A. Demolition materials and debris classified as non-hazardous construction and debris (C&D) wastes shall be transported off-site and disposed at permitted disposal facilities in conformance with all applicable local, state and federal regulations.

3.04 SITE RESTORATION

- A. Backfill excavated areas in accordance with the requirements of Section 31 23 43.
- B. Rough grade and compact areas affected by demolition to maintain existing site grades and to accommodate subsequent construction operations.
- C. The Contractor is responsible for temporary surface stabilization (including seeding) of all disturbed areas as specified in Section 02125.

END OF SECTION

SECTION 02 61 14
EXCAVATION OF IMPACTED SOILS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes requirements for excavation and removal of impacted soils for Site remediation. The estimated limits of excavation are indicated on the Drawings. The extent of the excavation may be modified based on field data.
- B. Related Sections:
 - 1. Section 01055 – Construction Staking
 - 2. Section 01 35 29 – Health and Safety for Demolition and Remediation
 - 3. Section 01 57 00 – Temporary Controls for Demolition and Remediation
 - 4. Section 02 61 15 – Stabilization of Excavated Impacted Soils
 - 5. Section 02 61 17 – Stockpiling and Loading of Impacted Materials
 - 6. Section 02 81 00 – Transportation and Disposal of Impacted Materials
 - 7. Section 31 23 43 – Backfilling and Grading for Remediation

1.02 SUBMITTALS

- A. During the progress of the Work, submit to the City DWM a written record of daily progress of the excavation work in a form acceptable to City DWM. Daily progress records shall be submitted at the beginning of the subsequent day's work.

1.03 QUALITY ASSURANCE

- A. The Remediation Contractor's surveyor shall field determine and lay out the locations, elevations and horizontal limits for impacted soil removal based on information provided.
- B. Confirmation sampling and analysis shall be performed by the Remediation Contractor.

1.04 PROJECT CONDITIONS

- A. The Remediation Contractor is solely responsible for excavation slope stability. Excavation work shall be performed in compliance with all applicable local, state and federal regulations, including but not limited to the requirements of OSHA in 29 CFR 1926 Subpart P – Excavations. Provide shoring, bracing, sloping and/or benching as required. Special emphasis shall be taken to provide excavation support and protection at limits of all work areas adjacent to roadway rights-of-way and other property boundaries.
- B. Work shall be performed in a manner that does not disturb or damage existing structures, utilities, sidewalks, streets, and other facilities not indicated to be removed as specified in Section 01 57 00.

- C. The Remediation Contractor shall provide temporary controls as required for health and safety and for pollution prevention during excavation activities in accordance with the requirements of Section 01 57 00.
- D. The Remediation Contractor shall take every effort necessary to prevent cross-contamination and re-contamination of cleaned areas and adjacent undisturbed areas. Equipment used for excavation and handling of contaminated materials shall be decontaminated prior to removal from the Site.
- E. Work will involve the handling of materials containing substances that are potentially harmful to the health and safety of remediation personnel. Perform work in compliance with all applicable regulations. Conform to the requirements of Section 01 35 29, including preparation of a Site-Specific HASP in advance of mobilization to the Site.

1.05 COORDINATION AND SCHEDULING

- A. Coordinate excavation work with (as applicable) stockpiling or direct loading, stabilization, sampling and transportation of excavated impacted soils for off-site disposal.
- B. Sequence the excavation work to allow the required time for confirmation sampling and analyses and for stabilization of soils as specified in this section and in Section 02 61 15. Excavation work shall be performed in accordance with the approved Demolition and Remediation Progress Schedule and Work Plan (specified in Section 01 31 00).

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 IDENTIFICATION OF IMPACTED MATERIALS

- A. Site investigations performed by previous consultants and the City DWM have identified areas on the Site that require remediation. The approximate locations, horizontal limits, and excavation depths of areas to be excavated are shown on the Drawings.
- B. The process for field identification of impacted soil areas, including confirmation sampling, is specified in subsection 3.04.
- C. The Remediation Contractor's personnel shall maintain awareness for environmentally suspect conditions, including but not limited to buried tanks, odors, staining, pooled liquids (other than water), and waste materials, and immediately notify the City DWM of any such suspect conditions for further evaluation.
- D. The Remediation Contractor shall maintain awareness for subsurface utilities and immediately notify the City DWM of any utilities not indicated on the Drawings.

3.02 PREPARATION

- A. Preparation of the Site for excavation of impacted soils includes, but is not necessarily limited to, the following:
 - 1. Coordination with others for removal or relocation of trees, utilities and streets as needed.
 - 2. Installation and maintenance of temporary erosion, sedimentation and pollution control measures.
 - 3. Implementation of health and safety procedures in compliance with all applicable regulations of authorities having jurisdiction, including decontamination facilities and procedures as specified in Section 01 35 29.
 - 4. Protection of all existing utilities (buried and above grade), structures, and other facilities on the Site not indicated to be removed.
 - 5. Surveying to lay out the Work in accordance with the applicable requirements of Section 01055 – Construction Staking.
 - 6. Abandonment of existing monitoring wells (if required).
 - 7. Cutting and removal of existing asphalt pavement and concrete slabs within the limits of areas to be excavated.
 - 8. Installation of temporary excavation support and protection at limits of excavations as required.
 - 9. Dewatering to control and remove surface water and groundwater seepage into excavations.

3.03 EXCAVATION AND REMOVAL OF IMPACTED SOILS

- A. Excavation and removal of impacted soils shall conform to the requirements of the Georgia EPD-approved Voluntary Investigation and Remediation Plan (VIRP) (as modified in Semi-Annual Status Report #4), and as specified herein.
- B. Excavate and remove all soils and other subsurface materials encountered to the full depths and limits indicated on the Drawings or as otherwise directed by the City DWM based on the results of confirmation sampling. In general, this will involve the following (unless otherwise shown or directed):
 - 1. Excavate impacted soils down to the limits of impacted soil exceeding 400 mg/kg as indicated on the Drawings, or to groundwater table, whichever is encountered first.

2. Where the Drawings indicate excavation below the groundwater table within the horizontal limits of the impacted soil areas, all soil excavated below the groundwater table shall be stockpiled in maximum 500-ton increments and one representative sample from each stockpile shall be analyzed for total lead. Stockpiles with concentrations equal to or exceeding 400 mg/kg shall be handled in the same manner as impacted soil from above the groundwater table. An exception shall be where confirmation sampling previously verified the vertical extent of impacted soil at a level above the groundwater table.
- C. All excavated soil shall be temporarily placed on-site in stockpiles of approximately 500-ton increments as specified in Section 02 61 17. One representative sample from each stockpile shall be analyzed for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP). Stockpiles exceeding the regulatory standard of 5 mg/kg TCLP lead shall be stabilized as specified in Section 02 61 15 prior to off-site transport.
- D. The extent of excavation in each area shall be based on the requirements shown on the Drawings and information determined by the City DWM in the field as a result of confirmation sampling at the limits of the planned excavations as specified in subsection 3.04.
- E. The limits of excavation adjacent to paved roadways, structures, buried utilities, property lines and other objects shall not extend beyond the limits determined and approved by the City DWM and other agencies having jurisdiction.
- F. Excavation and removal of impacted soils in each location will be considered complete when excavation limits are in conformance with applicable regulations and the requirements of this Section as determined by the City DWM.

3.04 CONFIRMATION SAMPLING

- A. Upon removal of impacted soils to the initial designated limits of excavation, confirmation sampling shall be performed by the Remediation Contractor. Depending on the results of the confirmation sampling, additional excavation and confirmation sampling followed by City DWM's evaluation shall continue in an iterative process.
- B. When initial excavation is complete at each location, discontinue excavation at that location and prepare for collection of confirmation samples. Excavation work shall proceed at other locations while test results are pending.
- C. Confirmation sampling for determination of impacted soil areas to be excavated includes but is not necessarily limited to the following:
 1. Collect sidewall soil confirmation samples at mid-depth at the locations indicated on the Drawings, generally at a spacing of one per 25 linear feet of sidewall (as long as the excavation depth does not extend beyond 8 feet below ground surface). In the event that the excavation extends deeper than 8 feet below ground surface, additional sidewall soil confirmation samples will be required.

2. Collect confirmation samples at the bottom of excavations that are above the groundwater table at the rate of one sample per 1,000 square feet of excavation bottom.
 3. Soil confirmation samples shall be analyzed for total lead via EPA Method 6010C. The Remediation Contractor shall provide the analytical results to the City DWM for evaluation.
 4. Areas where soil samples indicate total lead concentrations that are equal to or greater than 400 mg/kg will require additional excavation. The extent and direction of additional soil excavation will be determined by the City DWM after evaluating the analytical results.
 5. Areas where soil samples indicate total lead concentrations less than 400 mg/kg will not require additional excavation beyond the initial excavation limits in the designated portions of the excavation.
 6. The Remediation Contractor shall anticipate some delay due to laboratory turnaround times for soil sample analyses.
- D. Soils with total lead concentrations exceeding 400 mg/kg are required to be removed.
- E. Provide written notification to the City DWM at the start of each day's activities providing information on the excavation areas that are anticipated to be complete and ready for collection of confirmation samples during the work day.
- F. Approximately 24 to 36 hours will typically be required from the time when results of laboratory analyses are submitted to the City DWM and directions are given by the City DWM to either perform additional excavation or backfill. Additional time will be required over weekends and holidays and in the event of any delays in reporting of results by the analytical laboratory. City DWM's directions will be provided both verbally and in writing.

3.05 MATERIALS HANDLING AND DISPOSAL

- A. Unless otherwise approved, excavated impacted soils shall be stockpiled in approximately 500-ton increments in preparation for stabilization and characterization sampling (by Remediation Contractor) prior to being loaded into transport vehicles for off-site disposal as specified in Section 02 61 17. City DWM will provide notice to the Remediation Contractor when a given stockpile has been approved and may be loaded for transportation to the landfill. The Remediation Contractor shall keep in mind that some stockpiles may require additional stabilization and re-sampling for characterization purposes prior to transportation to the landfill as specified in Section 02 61 17.

- B. Remediation Contractor shall be responsible for testing of all excavated soils on-site, stabilization of soils that exceed TCLP limits based on testing, and characterization sampling of stabilized soil as specified. Mix stabilization amendments and take other measures necessary for transportation and disposal of the materials as approved by the disposal facility as specified in Section 02 61 15.
- C. Removed soils shall be loaded for transport as soon as practical after stabilization and characterization of excavated soils has been completed and approval by the City DWM has been provided.
- D. Remediation Contractor shall be responsible for sampling and testing to determine the regulatory status of excavated and stabilized soils for transportation and disposal.
- E. Transportation and disposal of excavated soils shall conform to the requirements of Section 02 81 00.

3.06 BACKFILLING

- A. Backfilling of areas where removal of impacted soils has been completed shall proceed immediately upon receipt of approval by the City DWM.
- B. If soil backfill material is placed into excavation areas by the Remediation Contractor prior to receiving results of confirmation sampling and analysis (by Remediation Contractor) and approval from the City DWM, the backfill material shall be considered contaminated. In such instances, the backfill material shall be removed from the excavation, stabilized if required, and loaded for transport to an off-site disposal facility at the Remediation Contractor's expense. The City DWM will make determination as to the limits of contamination.
- C. Backfilling of excavation areas is specified in Section 31 23 43.

END OF SECTION

SECTION 02 61 15
STABILIZATION OF EXCAVATED IMPACTED SOILS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the mixing of an approved reagent with excavated impacted soils containing lead for stabilization to immobilize constituents of concern. Section does not include in-situ stabilization.
- B. Related Sections:
 - 1. Section 01 31 00 – Project Management and Coordination for Demolition and Remediation
 - 2. Section 02 61 17 – Stockpiling and Loading of Impacted Materials
 - 3. Section 02 81 00 – Transportation and Disposal of Impacted Materials

1.02 REFERENCES

- A. Code of Federal Regulations Publications (CFR):
 - 1. U.S. Environmental Protection Agency
 - a. 40 CFR 261, Identification and Listing of Hazardous Waste
- B. United States Environmental Protection Agency (USEPA):
 - 1. SW-846.3-3, Test Method 1311: Toxicity Characteristic Leaching Procedure (TCLP).

1.03 PERFORMANCE REQUIREMENTS

- A. An ex-situ stabilization system shall be used which provides a safe, reliable method to stabilize impacted soils so that the cured soils conform to the requirements of paragraph 1.03.C and are suitable for off-site hauling and disposal. Remediation Contractor shall be responsible for the design and implementation of the stabilization process.
- B. Unless otherwise approved by the City DWM, all excavated soils shall be placed into stockpiles of maximum 500-ton increments on-site and a representative sample shall be analyzed from each stockpile for TCLP lead. Requirements for stabilization, subsequent sampling and re-stabilization as needed, and disposal are specified in subsection 3.01 of this Section.

1.04 SUBMITTALS

- A. Submit the following for review prior to commencement of the Work:
 - 1. A Soil Stabilization Work Plan covering all operations associated with the on-site ex-situ stabilization of excavated soils. This Work Plan shall be included in the Demolition and Remediation Work Plan specified in Section 01 31 00. The Soil Stabilization Work Plan shall include, but is not to be limited, to the following:

- a. Proposed sequencing and methods for placement of excavated soil in stockpiles, initial stabilization of the soils, analytical testing, and re-stabilization and re-testing as required, showing conformance with the Specifications.
 - b. Description of equipment to be used for the stabilization of soils.
 - c. The proposed mix design and method of mixing, and the proposed source of water.
 - d. Reagent type and composition, certificates of analysis, and Safety Data Sheets (SDS) for all proposed stabilization products.
 - e. Layout drawings, including proposed stockpile plan and details.
 - f. Identification of potential air and dust emissions, control systems to maintain compliance with applicable regulations, and proposed testing protocol for air and dust emissions.
 - g. A quality control plan which addresses control and documentation of batch proportions, mixing process, sample collection, and post-stabilization testing.
 - h. Procedures for post-stabilization cleanup and sampling plan for the mixing areas.
- B. The City DWM will review the submittals, and either approve or notify the Remediation Contractor of any deficiencies. Work shall not commence on the stabilization of the soils until the Remediation Contractor has received written approval of the submittal documents.
- C. Submit the following to the City DWM during the progress of the Work:
- 1. Daily batch proportions and mixing quality control data.
 - 2. Written copies of the results of all analytical testing.

1.05 QUALITY ASSURANCE

- A. Analytical testing shall be performed by a qualified independent testing laboratory retained by the Remediation Contractor and approved by the City DWM.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Reagents shall be shipped in properly labeled containers, accompanied by certificates of analysis.
- B. Conform to manufacturers' instructions for handling and storage of reagents.

PART 2 PRODUCTS

2.01 REAGENTS

- A. The Remediation Contractor shall select appropriate reagent(s) (such as EnviroBlend or lime), as approved by the City DWM, and shall determine appropriate mix proportions to ensure that the performance requirements have been attained. Mix proportions may be adjusted as work proceeds to allow for changing conditions.

PART 3 EXECUTION

3.01 STABILIZATION OPERATIONS

- A. All stabilization work shall be conducted in accordance with the approved Soil Stabilization Work Plan. The Remediation Contractor shall develop the Work Plan based on the requirements specified in the following paragraphs.
- B. Erosion and Sedimentation Control
 - 1. Erosion, sedimentation and pollution control measures shall be implemented prior to commencement of stabilization activities in conformance with all applicable regulations.
- C. Stockpiling
 - 1. Temporary stockpiles for excavated soils shall be located near excavations unless otherwise approved by the City DWM.
 - 2. Stockpiling of excavated soils shall conform to the requirements of Section 02 61 17, including suitable liners to provide a physical separation between soils and the ground surface, covers, and run-on control.
- D. On-Site Transportation of Excavated Soils
 - 2. If allowed by the City DWM, excavated soils may be transported to separate on-site mixing area(s) using approved methods. Spills shall be cleaned up immediately.
- E. Stabilization Equipment
 - 1. Stabilization shall be performed using equipment and methods capable of producing a thoroughly mixed uniform material.
 - 2. Control the proportions of mix constituents by suitable volumetric or weight measuring devices.
- F. Stabilization of Dissimilar Soils

1. Dissimilar soils may need different mixing ratios and shall not be mixed together unless approved by the City DWM.

G. Stabilization, Re-Stabilization and Disposal of Soils

1. Determination of requirements for stabilization and disposal of excavated soils shall be based on the results of sampling and analytical testing as specified.
2. After initial sampling and analytical testing, soils that indicate a lead TCLP concentration less than 5 mg/L may be transported offsite as non-hazardous material for disposal at an approved Subtitle D facility as specified in Section 02 81 00 after receipt of approval by the City DWM. Soils that indicate a TCLP concentration equal to or exceeding 5 mg/L shall require stabilization.
3. Following initial stabilization, a second representative sample shall be collected and analyzed for TCLP lead. Stabilized soils with a TCLP lead concentration less than 5 mg/L may be transported offsite as non-hazardous material for disposal at an approved Subtitle D facility as specified in Section 02 81 00 after receipt of approval by the City DWM. Soils that indicate a TCLP concentration equal to or exceeding 5 mg/L shall require a second attempt at stabilization.
4. Following the second stabilization, another representative sample shall be collected and analyzed for TCLP lead. Stabilized soils with a TCLP lead concentration less than 5 mg/L may be transported offsite as non-hazardous material for disposal at an approved Subtitle D facility as specified in Section 02 81 00 after receipt of approval by the City DWM. Soils that indicate a TCLP concentration equal to or exceeding 5 mg/L shall require disposal as hazardous material at a facility appropriate to the regulatory status of the material as specified in Section 02 81 00 after receipt of approval by the City DWM.

3.02 QUALITY CONTROL PROCEDURES

- A. Mixing time, and amounts of impacted material, reagents, and water added to each batch shall be recorded. Mixing time and batch proportions shall be maintained within the limits indicated in the approved Work Plan.
- B. Tests shall be performed on representative samples of stabilized material. All samples before and after stabilization shall consist of a five-point composite. Each composite sample shall consist of five grab samples that are transported to the laboratory under chain-of-custody protocols and composited in the laboratory.
- C. Sampling of stabilized soil shall be conducted by the Remediation Contractor. Samples shall be obtained at the following frequency:

Parameter	Frequency
TCLP (USEPA SW-846.3-3)	1 per 500 tons stabilized or 1 per day (whichever occurs first)

- D. The Remediation Contractor shall arrange for samples to be shipped to and tested by an approved testing laboratory, with turnaround times not to exceed 48 hours unless otherwise approved by the City DWM.

3.03 RECORDKEEPING

- A. Maintain copies of daily batch proportions, mixing quality control data, and analytical testing results during remediation activities, and submit to the City DWM as specified in subsection 1.04.C.

END OF SECTION

SECTION 02 61 17
STOCKPILING AND LOADING OF IMPACTED MATERIALS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes on-site temporary stockpiling of excavated impacted materials for testing and stabilization, and loading of the excavated materials for off-site transportation and disposal.
- B. Related Sections:
 - 1. Section 02 61 15 – Stabilization of Excavated Impacted Soils
 - 2. Section 02 81 00 – Transportation and Disposal of Impacted Materials

PART 2 PRODUCTS

2.01 STOCKPILE PROTECTION MATERIALS

- A. Furnish all materials required for construction and maintenance of stockpiles.
- B. Stockpile bottom liners shall consist of polyethylene or other approved impermeable geomembrane that is resistant to weathering and degradation due to contact with impacted materials for the duration of the Work. Bottom liners shall have a minimum thickness of 20 mils. Liners shall be furnished with prefabricated shop welded seams, and dimensions maximized to provide the largest manageable sheet.
- C. Stockpile covers shall be 6-mil (minimum thickness) polyethylene sheeting or other approved impermeable geomembrane.
- D. Stockpile covers and liners shall be free of holes or tears. Defective material shall be repaired or replaced, as determined by the City DWM.
- E. Furnish sand bags or other weights of sufficient quantity and weight to hold the stockpile covers in position.

PART 3 EXECUTION

3.01 STOCKPILING - GENERAL

- A. Coordinate stockpiling and loading work with excavation work.
- B. Establish separate stockpiles as necessary for management and treatment of excavated materials prior to transport of excavated materials for off-site disposal. Each soil stockpile shall consist of approximately 500 tons of soil to facilitate stabilization and characterization sampling.

- C. Remediation Contractor shall establish an identification system to keep track of each separate stockpile and its status (including whether soil has been stabilized, characterized, re-stabilized, ready for transport, and other condition). Install markers such as marked flags or stakes with signs with identification symbols/numbers in each stockpile and provide tracking using a database or other suitable system.
- D. Saturated soil, if encountered, shall be placed in an approved staging area constructed with perimeter berms and an appropriate liner and allowed to naturally drain/dry. The material shall not be mixed with additives to dry. Proposed construction of dewatering staging area and method of draining/drying of the material shall be included in the Dewatering Plan.
- E. Remediation Contractor shall be responsible for constructing stockpiles, and for inspection, maintenance, modification and repair of stockpiles.
- F. Line and cover excavated material stockpiles, and prevent precipitation and stormwater from contacting materials contained in the stockpiles.
- G. Determine the quantity and layout for temporary stockpiles based on the sequencing of the Work and required rates of loading transport vehicles.
- H. No more than 2,500 tons of excavated impacted soil shall be stockpiled at the Site at any one time without prior approval of the City DWM.

3.02 STOCKPILE CONSTRUCTION

- A. Prepare clean areas for stockpile construction. Remove sharp stones and other debris and provide a smooth surface to protect bottom liners from puncture and tearing under anticipated loading.
- B. Provide run-on controls, including berms and other facilities, to divert storm water away from stockpiles. Stormwater that contacts the stockpiled materials shall be collected and managed.
- C. Install bottom liner to fully cover the ground surface for each stockpile without field seams or overlaps. Anchor the geomembrane as required to prevent displacement.
- D. Install stockpile covers in a manner that minimizes wrinkles. Overlap adjacent panels of polyethylene sheeting a minimum of four feet. Place sandbags or other appropriate ballast on the covers to prevent uplift from wind. Ballast shall be placed along all edges of the stockpile and along panel overlaps.
- E. Protect the geomembrane cover from damage. Remove and replace damaged geomembrane as directed by the City DWM.

3.03 STOCKPILE MANAGEMENT

- A. Excavated materials to be stockpiled shall be placed only in properly constructed and maintained stockpiles. Do not place any designated clean materials in the

excavated material stockpiles.

- B. Prevent contaminated soil dust from becoming airborne. Place and anchor stockpile covers at the completion of each work day and during periods of rain or wind. Cover the stockpiles whenever the stockpiles are not being used.

3.04 STOCKPILE INSPECTION

- A. City DWM will inspect excavated material stockpiles frequently to verify the integrity of the stockpile liner and cover system.
- B. All deficiencies noted by the City DWM shall be immediately corrected to the satisfaction of the City DWM. If necessary, stockpiled material shall be relocated to a new impacted material stockpile so that repairs can be made. The new stockpile shall be separate from other stockpiles and shall be constructed in accordance with the requirements of this Section.
- C. Each stockpile shall be visually inspected by the Remediation Contractor each day for damage, and immediately repaired as necessary.

3.05 SOIL STABILIZATION

- A. Conform to the requirements of Section 02 61 15 for stabilization of excavated and stockpiled soils that fail TCLP.
- B. Remediation Contractor shall ensure all material is suitable for transport prior to loading (e.g. passes SW-846 Test Method 9095B: Paint Filter Liquids Test).

3.06 LOADING

- A. Prepare and load all vehicles for transport and disposal of excavated materials as specified in the following paragraphs. All vehicles transporting excavated impacted materials shall be lined in accordance with applicable regulations.
- B. Coordinate with the selected waste hauler to furnish all transport vehicles required for transportation of materials from the Site as specified in Section 02 81 00.
- C. Visually inspect and decontaminate the exterior of all transport vehicles in compliance with all applicable regulations.
- D. Coordinate loading operations and hours with the operating hours of the disposal facility.
- E. Load all transport vehicles carefully to prevent spills. Stage vehicles within remediation areas so that spills will be contained within the area and easily removed. If required by the City DWM, spread polyethylene sheeting (or other geomembrane) on ground surface to cover area sufficient for vehicle loading.
- F. Remediation Contractor shall be solely responsible for proper loading of, and abiding by the load limits and weight limits for, all vehicles leaving the Site. All

fines, taxes, penalties or judgments resulting from overweight or improperly loaded vehicles shall be the Remediation Contractor's responsibility.

- G. Soil dropped on the ground during loading of transport vehicles shall be collected and loaded into the vehicles for disposal.
- H. At the completion of loading, visually inspect each transport vehicle before it leaves the Site to ensure that the material is securely contained to minimize the potential for spillage onto travel routes, including verification that the tailgate is secure and that the load is covered.

3.07 REMOVAL OF STOCKPILE CONTAINMENT MATERIALS

- A. After removal and disposal of stockpiled materials, perform gross decontamination of the stockpile areas.
- B. Remove bottom liners and top covers and dispose at an approved off-site disposal facility with the impacted materials at the completion of the Work in conformance with the requirements of Section 02 81 00.

END OF SECTION

SECTION 02 76 13
WELL ABANDONMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes abandonment of existing monitoring wells.
- B. Related Sections:
 - 1. Section 02 81 00 – Transportation and Disposal of Impacted Materials

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM C 33, Standard Specification for Concrete Aggregates
 - 2. ASTM C 150, Standard Specification for Portland Cement
- B. State of Georgia Laws and Regulations:
 - 1. “Water Well Standards Act of 1985”, Official Code of Georgia Annotated (O.C.G.A.) § 12-5-120 thru 12-5-138.
- C. United States Environmental Protection Agency (USEPA) Region 4, Science and Ecosystem Support Division (SESD):
 - 1. Guidance Document SESDGUID-101, latest revision, “Design and Installation of Monitoring Wells”, Section 2.8 “Well Decommissioning (Abandonment)”.

1.03 SUBMITTALS

- A. At completion of abandonment activities, submit Well Abandonment Documentation as specified in subsection 3.01.

1.04 QUALITY ASSURANCE

- A. Abandonment of wells shall be performed in compliance with all applicable regulations and industry standards, including documents referenced in subsection 1.02.
- B. Abandonment work shall be performed by an experienced drilling contractor under the direction of an experienced Professional Geologist or Professional Engineer, licensed in the State of Georgia.

1.05 PROJECT CONDITIONS

- A. Well abandonment activities shall be performed in a manner that does not disturb existing utilities or other facilities not indicated to be removed or abandoned.

- B. Abandonment of wells located within the limits of excavation for removal of impacted materials or other ground disturbing activities associated with remediation shall be completed as specified in this Section prior to commencement of excavation work.

PART 2 PRODUCTS

2.01 CEMENT-BENTONITE GROUT

- A. Cement-bentonite grout shall be a mixture of Type II or IV Portland cement (complying with ASTM C 150) and clean water in the proportion of 5 to 6 gallons of water per 94-pound bag of cement. The mix shall also contain approximately 30 percent sodium bentonite by weight.

2.02 CONCRETE

- A. Concrete shall consist of Type I or II Portland cement complying with ASTM C 150, aggregates complying with ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3,000 pounds per square inch (psi). Maximum size of aggregates shall be one inch for concrete placed in boreholes as part of well abandonment.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Well Abandonment Documentation shall be prepared for each abandoned well and shall include:
 - 1. Well location and number;
 - 2. Date abandoned;
 - 3. Names of drilling contractor, and engineer/geologist;
 - 4. Materials used;
 - 5. Well diameter; and
 - 6. Total well depth.

3.02 PREPARATION

- A. Prior to commencement of the Work, the wells to be abandoned will be marked by the City DWM. Abandonment activities shall not proceed until the City DWM marks and verifies the locations.
- B. No existing or newly installed monitoring wells shall be damaged by the Contractor other than those wells identified on the Drawings or marked in the field to be abandoned. Damage shall be defined as disturbance to the well which causes it to be no longer plumb or damages the surface seal. Repairs or replacement of damaged wells, if required, shall be performed at no additional cost to the Project.

3.03 ABANDONMENT OF MONITORING WELLS

- A. The wells to be abandoned are identified on the Drawings or otherwise identified on the Site. Contractor shall perform a Site walk with the City DWM to determine if wells exist on the Site and to confirm wells that are to be abandoned, if any. Different procedures shall be required depending on the type and location of the well as specified in the following paragraphs.
- B. Abandon (decommission) designated existing monitoring wells in accordance with the referenced SESD guidance document, Georgia EPD regulations, and as specified in the following paragraphs.
- C. Remove surface completion components such as well cover manholes, protective covers, concrete pads, and protective bollards (as applicable).
- D. Existing wells with no seal shall be abandoned using the following procedures (or as otherwise directed by the City DWM based on regulatory requirements):
 - 1. Place specified cement-bentonite grout into the casing to within 10 feet of ground surface.
 - 2. Auger with a hollow-stem auger over the well casing to remove well casing and the sand backfill materials from the hole.
 - 3. Backfill the clean borehole with specified cement-bentonite grout. The grout shall be placed into the borehole from the bottom to the top by pressure grouting with the positive displacement method (tremie method).
 - 4. The top two feet of the borehole shall be filled with concrete to ensure a secure surface seal.
- E. Existing wells that are single-cased and sealed may be abandoned by grouting in place in accordance with the following procedures (or as otherwise directed by the City DWM based on regulatory requirements):
 - 1. Cut the casing off two to three feet below grade.
 - 2. Place specified cement-bentonite grout into the borehole from the bottom to the top by pressure grouting with the positive displacement method (tremie method).
 - 3. The top two feet of the borehole shall be filled with concrete to ensure a secure surface seal.

3.04 RESTORATION AND CLEANUP

- A. For wells that are abandoned outside the limits of site excavation and grading, excavations resulting from the removal of well components shall be backfilled up to existing grade using approved soil backfill material.

- B. After wells have been abandoned, remove tools and waste materials (including grout, well components and other debris).

3.05 DISPOSAL OF MATERIALS

- A. Removed well components in contact with soil, and other waste materials resulting from abandonment activities shall be disposed by the Contractor in accordance with the requirements of Section 02 81 00.

END OF SECTION

SECTION 02 80 13
REGULATED BUILDING MATERIAL REMOVAL AND DISPOSAL

PART 1 GENERAL

1.01 SUMMARY

- A. Work of this Section includes the removal, handling, storage, transportation, disposal, and recycling of Regulated Building Materials (RBM) in accordance with applicable US EPA, US OSHA, NESHAP, Georgia EPD prior to commencement of demolition of structures.
- B. Related Sections:
 - 1. Section 02 26 00 – Regulated Building Material Removal and Disposal
 - 2. Section 02 41 17 – Building Demolition

1.02 REFERENCES

- A. U.S. Environmental Protection Agency (EPA) Regulations for Asbestos (Code of Federal Regulations Title 40, Part 61, Subparts A).
- B. U.S. EPA National Emissions Standards for Hazardous Air Pollutants (Code of Federal Regulations Title 40, Part 61).
- C. US EPA Asbestos Hazard Emergency Response Act (AHERA) regulations (Code of Federal Regulations Title 40 Part 763, Subpart E).
- D. U.S. EPA Office of Pesticide and Toxic Substances Guidance Document, "Guidance for Controlling Friable Asbestos Containing Materials in Buildings", EPA 56015 85 024, June, 1985.
- E. U.S. EPA Toxicity Characteristic Leaching Procedure (TCLP) Method 1311, SW-846.
- F. U.S. EPA Protection of Stratospheric Ozone (Code of Federal Regulations 40 CFR, Part 82).
- G. U.S. EPA Regulations Identifying Hazardous Waste (Code of Federal Regulations 40 CFR, Part 261).
- H. U.S. EPA Regulations for Hazardous Waste Generators (Code of Federal Regulations 40 CFR, Part 262).
- I. U.S. EPA Regulations for Hazardous Waste Transporters (Code of Federal Regulations 40 CFR, Part 263).
- J. U.S. EPA Universal Waste Rule, Thermostat Ampoule Removal Standards (Code of Federal Regulations 40 CFR, Parts 273.13/.33).
- K. U.S. OSHA Asbestos Regulations (Asbestos Standard for Construction, (29 Code of Federal Regulations 1926.1101).

- L. U.S. OSHA Asbestos Regulations for General Industry (29 Code of Federal Regulations 1910.1200, HAZCOM and 1910.120, HAZWOPER)
- M. U.S. OSHA Asbestos Regulations for Respiratory Protection (Code of Federal Regulations 1910.134).
- N. 29 CFR 1926 OSHA Standards for Construction Industry (29 Code of Federal Regulations 1926.59, HAZCOM)
- O. U.S. Department of Transportation, Hazardous Substances: Final Rule (Code of Federal Regulations Title 49 Parts 171 through 179).
- P. State of Georgia Asbestos Safety Act – Act 12, Chapter 12 of the Official Code of Georgia Annotated.
- Q. Rules of the Georgia Department of Natural Resources, Environmental Protection Division (EPD), Chapter 391-3-4, Asbestos Removal and Encapsulation Regulations.
- R. Rules of the Georgia Department of Natural Resources, Environmental Protection Division, Chapter 391-3-1, Rules for Air Quality Control.
- S. State of Georgia – Rules of the Asbestos Licensing Board, Chapter 52-1 through 52-7.
- T. State of Georgia – Solid Waste Management Regulations, Chapter 391-2-4.
- U. State of Georgia – Air Quality Control Act, Section 12-9-1
- V. State of Georgia – Solid Waste Management Act, Act 1486, Section 1531
- W. All state, county, and city codes and ordinances as applicable. Make available for review at the Site one copy of EPA, OSHA, and applicable State, County, and City Regulations governing the Work.
- X. ANSI Publications: Z88.2-80; Practices for Respiratory Protection.
- Y. NIOSH: 81-123; Occupational Health Guidelines for Chemical Hazards.

1.03 DESCRIPTION OF WORK

- A. The Contractor is responsible for the development of RBM Removal Work Plan to describe the means and methods to remove, handle, store, transport and dispose of or recycle RBM identified by the assessment activities specified in Section 02 26 00.
- B. The Contractor is responsible for the identification, location, quantification, removal, handling, storage, transportation, and disposal or recycling of RBM that will or could be impacted by the demolition activities specified in Section 02 41 17.

- C. Work of this Section shall be performed in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations.

1.04 SUBMITTALS

A. Pre-Removal Submittals

1. Prepare and submit a detailed RBM Removal Work Plan and schedule for removal and disposal of the RBM at the Site. The RBM Removal Work Plan shall include the means and methods the Contractor proposes to utilize throughout the removal, handling, transportation, and disposal activities. The RBM Removal Work Plan shall include, but may not be limited to, the following:
 - a. A list, including quantities, of RBM to be removed and disposed of or recycled if different than those materials identified through the work of Section 02 26 00.
 - b. The processes to be used to remove, handle, store, transport, dispose of or recycle RBM.
 - c. Description of the methods, including sampling and analysis, used to characterize and profile waste generated by work of this Section.
 - d. Copies of Permits and Notifications required prior to commencement of work of this Section.
 - e. Provide name and address of the proposed waste disposal or recycling facility for each RBM to be removed during work of this Section.
 - f. A detailed description of the post removal site testing, sampling, and analysis required for each RBM to be removed.
 - g. A list of the subcontractors to be used for work of this Section. Include copies of required US EPA, US OSHA, NESHAP, and Georgia EPD permits, licenses, accreditations, and certifications, training for Contractor and subcontractors performing work of this Section.
 - h. A list of equipment to be used for the work of this Section.
 - i. Safety Plan including description of the Personal Protective Equipment to be used by workers during RBM removal and handling under the work of this Section.
 - j. The name of the individual responsible for preparation of the RBM Work Plan. Provide copies of the appropriate licensing, certifications, or accreditations for individual responsible for the preparation of the Work Plan.

- k. The names of the Superintendent and Head Foreman that will be on-site during work of this section. Provide copies of the appropriate licensing, certifications, accreditations, or training for the Superintendent and Head Foreman.
 2. Pre-Removal submittals shall be provided to the City DWM no later than 20 calendar-days prior to commencement of the work of this Section.
 3. The Pre-Removal Submittals will be reviewed and approved by the City DWM prior to commencement of site activities that could disturb RBM. Pre-Removal Submittals that are evaluated to be non-compliant with current US EPA, US OSHA, NESHAP, Georgia EPD regulations, and this Section will not be approved and the Contractor shall revise and resubmit.
- B. Post Removal Submittals:
1. Following completion of RBM removal and disposal or recycling provide a Post Removal Submittal package. The Post Removal Submittal package shall include, but may not be limited to, the following:
 - a. Notarized Certifications: Submit a notarized certification, signed by an officer of the Contractor or subcontractor performing the Work of this Section that states the work of this Section was performed in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations and that all workers were provided required training and personal protective equipment relevant to the RBMs removed.
 - b. Provide copies of required Applications, Permits, and Notifications submitted or received during the work of this Section.
 - c. Provide a list of the type and quantity of RBM removed and disposed of or recycled during the Work of this Section.
 - d. Provide copies of copies of required US EPA, US OSHA, NESHAP, and Georgia EPD licenses, accreditations, and certifications, training for Contractors or subcontractors that performed work of this Section if different than those submitted under Paragraph 1.03.A.
 - e. Provide copies of post removal sampling, testing, or analysis for each RBM to be removed.
 - f. Provide a completed form SF1: CERTIFICATION OF POST REMOVAL VISUAL EVALUATION (at end of this Section) for each structure from which RBM was removed.
 - g. Transportation, Disposal, and Recycle

- i. Provide name and address of waste transporters that moved RBM waste from the project site to disposal facilities. Provide copy of waste transporters state license and permit.
 - ii. Provide name and address of waste disposal and recycling facilities where RBM waste were disposed or recycled including, copy of state license and facility permits.
 - iii. Provide evidence of waste characterization and profiling for disposal, including laboratory sample results, for the RBM removed and disposed of through the work of this Section.
 - iv. Provide copies of receipts from disposal or recycle site operator which acknowledge the Contractor's delivery(s) of RBM waste materials. Receipts shall include date, type of material, quantity of material delivered, and signature of authorized representative of disposal or recycle site.
- h. Post-Removal submittals shall be provided to the City DWM no later than 30 calendar-days following completion of site activities of this Section.

1.05 QUALITY ASSURANCE

- A. Contractor shall conform to applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations related to RBM removal, handling, storage, disposal, and recycling.
- B. Contractor shall be solely responsible for proper removal, handling, transportation, disposal, and waste management activities covered by this Section.
- C. Contractor shall:
 1. Prepare the RBM Removal Work Plan for under the direction of a properly licensed, certified, or accredited individual in accordance with US EPA, US OSHA, NESHAP, and Georgia EPD regulations as appropriate for each RBM to be removed.
 2. Have a record of not less than two years successful experience in hazardous and regulated materials removal and related work similar in scope and magnitude to this project.
 3. Maintain on-site, a Superintendent and one Head Foreman, each having not less than one year of full-time experience in responsible charge of hazardous and regulated material removal operations similar in scope and magnitude to this project within the three-year period preceding start of project. Provide sufficient number of supervisory personnel on-site during all phases of the work.

- 4. Use only trained and experienced material removal workers to perform the work. Train workers in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations.
 - 5. If subcontractors are used to complete the work of this section, the subcontractors and their workers shall be licensed, certified, or accredited in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations.
- D. Contractor shall ensure that no environmental pollution, releases, or other liabilities result from the Contractor's activities during removal, handling, disposal, or recycling. In the event that environmental pollution, releases, or other liabilities occur, or are incurred due to the Contractor's activities, the Contractor shall promptly correct or remediate such conditions at no additional cost to the Owner.

1.06 PROJECT CONDITIONS

- A. Work with the City DWM to coordinate schedule for site access to perform work of this Section.
- B. Use procedures necessary to ensure that no portion of the structures become a hazard to persons by instability or other condition due to removal of RBM.
- C. Use procedures necessary to ensure that no unauthorized persons have access or exposure to RBM or RBM waste during removal, handling, storage, transportation, or disposal activities.
- D. Provide required notifications to US EPA, US OSHA, NESHAP, and Georgia EPD agencies having jurisdiction for work of this Section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Barricade the work areas and provide other controls for protection of personnel. Maintain barricades, signage and other required controls during work of this Section.
- B. Establish, maintain, and secure regulated work areas as required by regulations. Do not permit visitors or trades not performing RBM removal work of this Section to access regulated work areas.
- C. Properly remove, handle, store, and transport RBM on site in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations.
- D. Perform selective demolition necessary to access and remove potentially hidden or enclosed RBM.

- E. Provide general clean-up of work areas concurrently with the removal of RBM. Do not allow accumulation of removed materials on floor or ground.
- F. Following completion of RBM removal perform the following Clean-Up and Standard of Completion:
 - 1. Clean surfaces in the work area(s) as necessary.
 - 2. Remove waste containers from work area/building.
 - 3. Notify the City DWM to accompany Contractor of visual inspection. Removal will be deemed to be complete when a visual inspection by the Contractor and City DWM observes no visual regulated building materials or residue thereof. Visual evaluation for each regulated area or building shall be documented with the Certification of Visual Evaluation (SF-1) found at the end of this Section.
- G. Do not mix RBM waste streams. Where feasible, separate RBM waste from ordinary construction and demolition waste. Sort wastes, relative to DOT hazard type and provide a generator waste material profile sheet for each waste stream.
- H. Appropriately Containerize, label, and secure RBM removed during each work shift. Do not allow removed RBM to remain loose, non-containerized, and non-secure on site after the shift on which it is removed is over.
- I. Transport RBM off-site directly to either a properly licensed and accredited off-site temporary storage facility or to the designated disposal or recycling facility within two calendar days from the day the material is removed.
- J. Transport RBM in accordance with applicable Federal, State, and Local regulations and ordinances. Ensure that RBM is received at the designated disposal or recycling facility within five calendar days from day the material is removed at the site.

END OF SECTION

SF1: CERTIFICATION OF VISUAL EVALUATION

Project Name _____

Location _____

Date _____ Work Area/Building _____

List of RBM Removed from Work/Area/Building: _____

Contractor hereby certifies that he has visually inspected the work area and/or building and has found no visual evidence of remaining Hazardous or Regulated Materials or residue thereof and Hazardous or Regulated Materials have been removed and handled in accordance with applicable US EPA, US OSHA, NESHAP, and Georgia EPD regulations.

Contractor: _____

(Company)

Signed by: Signature _____ Date _____

Name _____

(Please Print)

Title _____

SECTION 02 81 00
TRANSPORTATION AND DISPOSAL OF IMPACTED MATERIALS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes transportation and disposal of excavated impacted soils and waste materials.
- B. Related Sections:
 - 1. Section 01 31 00 – Project Management and Coordination for Demolition and Remediation
 - 2. Section 02 61 17 – Stockpiling and Loading of Impacted Materials

1.02 REFERENCES

- A. State of Georgia Laws and Regulations:
 - 1. Official Code of Georgia Annotated (O.C.G.A.) § 32-6-20 through 32-6-28
 - 2. Chapter 672-2 of the “Administrative Rules and Regulations of the State of Georgia”

1.03 SUBMITTALS

- A. Submit the following for review prior to commencement of the Work (as part of the Demolition and Remediation Work Plan specified in Section 01 31 00):
 - 1. List of proposed waste haulers, and copies of all necessary permits and certifications, including haul route permits.
 - 2. Provide identity (name), location, and regulatory status for each proposed off-site disposal facility if Remediation Contractor proposes to use off-site disposal facilities other than those listed in subsection 3.07. Provide copies of all necessary permits and certifications, and identification of haul route to each facility.
- B. Submit written certification for vehicle weight scales used for measurement of quantities of materials transported to disposal facilities.
- C. Submit results of analysis of excavated impacted soils for disposal, and copies of manifests.
- D. Submit written certifications of proper transport and final disposal of excavated impacted soils and waste materials within 10 working days after disposal.

1.04 DEFINITIONS

- A. "Waste Materials" shall mean: demolition debris; cleared vegetation; spent PPE; rubbish; and other debris resulting from remediation activities that does not include excavated impacted soils.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION FOR TRANSPORT

- A. Retain an approved licensed and permitted waste transporter to transport excavated impacted soils and waste materials to approved off-site disposal facilities.
- B. Load materials for transport as specified in Section 02 61 17.

3.02 VEHICLE DECONTAMINATION

- A. Decontaminate all vehicles and equipment used in the excavation, loading, and hauling of impacted soils prior to leaving the Site. Construct and maintain an on-site vehicle decontamination facility in conformance with all applicable regulations.
- B. The vehicle decontamination facility shall be set up and operated by the Remediation Contractor. The facility shall be located at a suitable location at the limit of remediation within the Site where approved by the City DWM.
- C. The facility shall be separate from, and interior of, the Construction Exit which shall be set up for erosion, sedimentation and pollution control measures.
- D. Decontamination shall include physical removal of soil from the chassis (which includes undercarriage, suspension, and tire tracks) and other parts of vehicles and equipment as required. Use brushes, high-pressure water sprays or other suitable methods and tools to comply with applicable regulations.

3.03 OFF-SITE HAULING

- A. Transportation of excavated impacted soils and waste materials shall be in compliance with all applicable regulations, including regulations referenced in subsection 1.02.
- B. The possibilities of accidents and waste spillage or leakage during transportation shall be considered and addressed in the Remediation Contractor's Site-Specific Health and Safety Plan.

- C. In the event of a release or threatened spillage of excavated impacted soils or waste materials, Remediation Contractor shall immediately inform the City DWM, and implement clean-up procedures as specified in the following paragraph 3.03.D. It is imperative that all haul routes be kept free of any contamination due to the Remediation Contractor's operations.
- D. If a loaded transport vehicle is involved in a wreck or other occurrence that results in a spill, appropriate clean-up procedures shall be implemented in accordance with the requirements of the City of Atlanta and other authorities having jurisdiction. The Remediation Contractor shall provide appropriate spill response materials. Spill response materials shall be compatible with the types of materials and contaminants being handled.
- E. Loaded trucks transporting excavated impacted soils or waste materials shall not leave the Site or be loaded within one hour of the time that the off-site disposal facility closes for the day unless approved by the City DWM. Loaded trucks shall dump their loads in the off-site disposal facility the same day they are loaded.

3.04 TRANSPORTATION ROUTES

- A. Identify the main roadways intended for hauling of excavated impacted soils and waste materials, and obtain any required permits.
- B. Trucks and vehicles leaving the Site shall not leave any accumulations of debris on public roads.

3.05 MANIFESTS

- A. Excavated impacted soils meeting the TCLP lead limit of 5 mg/L and waste materials shall be classified as non-hazardous waste.
- B. Excavated impacted soils that do not meet the TCLP lead limit of 5 mg/L (after two rounds of stabilization), if any, shall be classified as hazardous waste and shall be disposed of appropriately after approval from the City DWM.
- C. Remediation Contractor shall prepare manifests, and prepare necessary paperwork for transportation and disposal of excavated impacted soils and waste materials.
- D. All excavated impacted soils and waste materials shall be manifested in accordance with applicable regulations. The manifests shall be based on waste profiles accepted at the disposal facility.
- E. The manifests shall be submitted for signature by the City DWM. Manifests may be signed by the Remediation Contractor if so authorized by the City DWM.

3.06 TRANSPORTATION REGULATIONS

- A. Obtain all required transportation permits for shipment of excavated impacted soils and waste materials.

- B. Transportation of excavated impacted soils and waste materials shall be in accordance with applicable local, state, and federal regulations including: 49 CFR 171 through 179.
- C. Local, state and federal laws and regulations that govern the dimensions and weights of vehicles transporting materials on the public roads (including permit requirements for overweight and oversize vehicles) are referenced in subsection 1.02.

3.07 DISPOSAL FACILITIES

- A. Waste shall be transported to an approved disposal facility appropriate to the regulatory status of the waste. The facilities shall conform to applicable regulations for Subtitle C or Subtitle D facilities.
- B. The following are approved Subtitle D facilities:
 - 1. Republic Services Pine Ridge Landfill, Griffin, GA
 - 2. Waste Management – Pine Bluff Landfill, Ball Ground, GA
 - 3. Eagle Point Landfill, Ball Ground, GA
- C. Use of other facilities is contingent on approval by the City DWM.

END OF SECTION

SECTION 31 23 19
DEWATERING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes dewatering requirements for control of groundwater and collected surface water in excavations during remediation activities.
- B. Related Sections:
 - 1. Section 01 31 00 – Project Management and Coordination for Demolition and Remediation
 - 2. Section 02 61 17 – Stockpiling and Loading of Impacted Materials

1.02 PERFORMANCE REQUIREMENTS

- A. Remediation Contractor shall be responsible for the design, implementation and operation of temporary dewatering systems.
- B. The extent of control of water includes, but is not limited to:
 - 1. Furnishing and installing all necessary pumps, piping, and accessories.
 - 2. Operation of the dewatering system to provide required conditions for construction as specified.
 - 3. Treatment and testing of collected dewatered liquids.
 - 4. Discharge or transport and disposal of collected dewatered liquids.
 - 5. Removing all temporary dewatering equipment and accessories after completion of excavation and backfill.

1.03 QUALITY ASSURANCE

- A. The Remediation Contractor shall have demonstrated experience in dewatering operations of the type required in the proposed work.
- B. Handling, treatment and discharge of removed water shall comply with all applicable local, state and federal environmental laws and regulations.

1.04 SUBMITTALS

- A. Submit the following for review prior to commencement of the Work:
 - 1. A Dewatering Plan, which shall be included in the Demolition and Remediation Work Plan specified in Section 01 31 00. The Dewatering Plan shall include the following at a minimum:

- a. Methods to be used for removal of surface water (where applicable) and dewatering of excavations.
- b. Surface water and groundwater dewatering system components and layout including (as applicable) size and type of pumps, pump locations, pipe sizes and capacities.
- c. Methods for handling and treatment of dewatering liquids.
- d. Water discharge methods and locations, and permitting requirements.
- e. Description of dewatering system installation procedures, and maintenance of equipment.
- f. Proposed construction of dewatering staging area and method for draining/drying of saturated excavated materials (as specified in Section 02 61 17).
- g. Dewatering system removal procedures.

1.05 PROJECT CONDITIONS

- A. Site surface and subsurface information has been obtained and is available for review. Remediation Contractor is responsible for determining the character of materials, extent of surface water and groundwater, and other conditions to be encountered. No warranty, either expressed or implied, is made as to the accuracy of the Site information provided by the City DWM.
- B. The Work shall be performed using methods that will achieve regulatory requirements for control of suspended particles and other regulated constituents in removed water during dewatering operations.

1.06 COORDINATION

- A. Dewatering shall be coordinated with other phases of the Work to comply with the approved schedule, to provide required conditions for excavation of materials, stability of excavations, control of groundwater during earthwork activities, and proper handling and disposal of removed groundwater as specified.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Provide and maintain at all times proper dewatering equipment to meet the requirements for the removal of water from excavations as specified.
- B. Keep on hand, or have immediate access to, additional pumps of sufficient capacity to provide reasonably for any equipment breakdown.

- C. Sufficient suction and discharge piping shall be available for adequate discharge of pumped liquids without causing erosion and sedimentation, or other adverse consequences.
- D. Provide frac tank(s) or tanker truck(s) complying with all applicable laws and regulations. Tank(s) shall be of sufficient capacity to handle the required storage volumes as determined by the Remediation Contractor.
- E. Provide and operate treatment equipment as required to treat removed liquids prior to discharge or disposal.

PART 3 EXECUTION

3.01 DEWATERING

- A. If groundwater is encountered during excavation work, the groundwater surface shall be lowered to a depth of at least one foot below the required excavation bottom.
- B. Operate and maintain the dewatering equipment until excavation of materials, and placement and compaction of soil backfill is complete up to at least two feet above the natural groundwater level or as otherwise approved by the City DWM.
- C. Removal of liquids shall not interfere with work performed on the Site by others.

3.02 HANDLING OF REMOVED LIQUIDS

- A. All water removed during dewatering operations shall be collected, stored, analyzed and discharged on-site or disposed off-site as approved by the City DWM using suitable equipment and methods.
- B. Dewatering of excavations and handling of liquids shall conform to the following requirements:
 - 1. Store dewatered liquids in frac tank(s) or tanker truck(s).
 - 2. Perform all necessary treatment of liquids in accordance with applicable regulations.
 - 3. Perform all necessary analyses on samples of liquids for the purpose of characterization prior to discharge or transport to off-site treatment or disposal facilities.
- C. Comply with all applicable regulations, including permit conditions for discharge of removed liquids on the Site (if allowed).
- D. Coordinate with the City DWM prior to discharge or off-site transport of water. Use methods to prevent pumping and discharge of sediment by installation of a silt filtration device at the end of each pump suction or discharge hose or other appropriate materials and methods.

3.03 REMOVAL OF DEWATERING SYSTEM

- A. Deactivate dewatering system at completion of the Work and remove dewatering equipment from the Site.
- B. All components of the dewatering system shall be decontaminated by steam cleaning or other approved method prior to removal from the Site.
- C. Repair and clean up all areas impacted by dewatering operations as approved by the City DWM.

END OF SECTION

SECTION 31 23 43
BACKFILLING AND GRADING FOR REMEDIATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes placement and compaction of backfill material after removal of impacted soils.
- B. Related Sections:
 - 1. Section 02125 – Temporary and Permanent Erosion and Sedimentation Control
 - 2. Section 02 61 14 – Excavation of Impacted Soils

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
 - 2. ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 3. ASTM D 2937, Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
 - 4. ASTM D 2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
 - 5. ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 6. ASTM D 4959, Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating
 - 7. ASTM D 6938, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.03 SUBMITTALS

- A. Prepare and submit a Borrow Source Pre-Qualification Investigation Plan, which shall include the following:
 - 1. Detailed description of planned field and laboratory investigation activities at the proposed borrow source(s), and itemization of how each component of the investigation will comply with specific pre-qualification requirements included in this Section.
 - 2. General borrow area sketch identifying the site and shape of the borrow area, prior history of the site over the past 10 years, planned depth of excavation, proposed sample locations and method of sample collection.
 - 3. Identification of all laboratories intended for use.

4. Scheduling: The City DWM shall be notified five days prior to sample collection and shall be present during field collection activities.
- B. Submit the following for review prior to commencement of the work of this Section:
1. Sampling and Analysis Plan (SAP).
 2. Test results and certifications for proposed borrow materials showing conformance with the Specifications.
- C. Submit the following during work progress:
1. Written reports of all specified tests showing conformance of the materials and constructed work with the Specifications.

1.04 QUALITY ASSURANCE

- A. Remediation Contractor shall retain the services of an approved independent Quality Control firm to perform specified testing of earthwork materials and constructed work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Backfill material shall be adequately protected to preserve the fitness and quality of the materials.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Soil which is purchased or otherwise imported onto the property from off-site must be accompanied by written evidence that it is appropriate for unrestricted use and that it does not exceed risk-based contaminant levels.
- B. At a minimum, the pre-qualification field and laboratory investigation to define the physical and chemical characteristics of any borrow source designated to be used at the property shall include the components listed in this subsection unless an alternative geotechnical investigation program is approved by the City DWM in writing prior to performing the investigation.
- C. The Remediation Contractor may submit an alternative investigation program in cases where previous information exists regarding the proposed borrow source. Any proposed alternative geotechnical investigation program, previous geotechnical information and justification for any reduction to the requirements in this Section shall be submitted by the Remediation Contractor with the Borrow Source Pre-Qualification Investigation Plan submittal.
- D. Chemical Testing Requirements:
1. Representative soil samples shall be collected from each proposed borrow source and shall be tested and reported by an approved licensed analytical laboratory. One sample shall be collected for each 10,000

cubic yards of borrow material available for use, and no less than two samples from each discrete borrow area.

2. The following chemical analyses shall be performed on each borrow area pre-qualification sample collected.
 - a) Total volatile organic compounds (VOCs via Test Method 8260B).
 - b) Total semi-volatile organic compounds (SVOCs via Test Method 8270D).
 - c) Total metals (Appendix IX, 40 CFR 264 via Test Methods 6010C & 7471B).
 - d) PCB's (via Test Method 8082A).
 - e) Pesticides (via Test Method 8081B) and herbicides (via Test Method 8151A).
3. Sampling shall be conducted in accordance with an approved Site Sampling and Analysis Plan (SAP) using procedures consistent with an USEPA or state guidance document.
4. Borrow soils shall have constituent levels that do not exceed the lesser of the following for all regulated substances (unless a variance is granted by the City DWM):
 - a) The Hazardous Site Response Act (HSRA) Notification Concentrations provided in Appendix I of the HSRA rules 391-3-19 O.C.G.A., Section 12-8-90.
 - b) The Type 1 HSRA Risk Reduction Standards calculated per 391-3-19-.07(6) of the HSRA rules.

E. Physical Testing Requirements:

1. Representative soil samples shall be collected from each proposed borrow source. One sample shall be collected for each 10,000 cubic yards of borrow material available for use, and no less than two samples from each discrete borrow area.
2. The following physical analysis shall be performed on each borrow area pre-qualification sample collected:
 - a) Soil Classification (ASTM D 2487)
 - b) Moisture-Density Curve, Standard Proctor (ASTM D 698)
 - c) Organic Content (ASTM D 2974)
 - d) Atterberg limits (ASTM D 4318)

2.02 SELECT SOIL BACKFILL

- A. Select Soil Backfill material shall be imported soil and shall have characteristics consistent with SP, SW, SM, SC, SP-SC, SP-SM, ML or CL soils as defined by the Unified Soil Classification System (USCS). The soil shall be substantially free of organic matter, degradable debris or objectionable material, including but not limited to: pavement material, frozen soil and rocks larger than four inches in greatest dimension.
- B. Quality Control Testing of Select Fill (after approval of borrow source):
 - 1. Soil Classification (ASTM D 2487): Minimum of one test from borrow source for every 10,000 cubic yards of loose soil and or each change in material.
 - 2. Proctor Moisture – Density Curve (ASTM D 698): Minimum of one test from borrow source for every 10,000 cubic yards of loose soil and for each change in material.

PART 3 EXECUTION

3.01 BORROW SOURCES AND HAULING

- A. Obtain Select Soil Backfill material from approved off-site borrow source(s). The Remediation Contractor shall be responsible for obtaining all required permits or approvals from authorities having jurisdiction, unless the borrow source is being operated under an existing permit.
- B. Unless otherwise provided in the Contract, the Remediation Contractor is responsible for obtaining the right to procure material, pay all required fees, and develop the sources including rights-of-way for hauling from the borrow source owner(s), and all required permits for hauling material on roadways to Project Site.

3.02 FIELD QUALITY CONTROL

- A. The following tests shall be performed during placement of Select Soil Backfill material:
 - 1. In-Place Density (using ASTM D 6938 or ASTM D 2937): Minimum of one test for each 16-inch thickness for every 2,000 square feet of material placed, and at every material change or as otherwise determined by the City DWM.
 - 2. Moisture Content (using ASTM D 6938 or ASTM D 4959): Minimum of one test for each 16-inch thickness for every 2,000 square feet of material placed, and at every material change or as otherwise determined by the City DWM.
- B. In-place density and moisture content testing performed using nuclear instruments shall be checked by comparison to test results using laboratory methods.

3.03 PREPARATION

- A. Backfilling of excavations shall not proceed until the City DWM has provided written documentation approving the limits of excavations and the completion of removal of impacted materials as specified in Section 02 61 14.

3.04 PLACEMENT OF BACKFILL – GENERAL REQUIREMENTS

- A. Excavations that have been completed based on the results of confirmation testing, achievement of excavations to the required limits, and subsequent approval by the City DWM shall be backfilled as specified in the following subsections.

3.05 PLACEMENT AND COMPACTION OF SELECT SOIL BACKFILL

- A. Place Select Soil Backfill in uniform layers not exceeding eight inches lift thickness and compact to a minimum of 95 percent of the material's maximum dry density as determined by ASTM D 698.
- B. The moisture content of soil backfill during compaction shall be maintained within plus or minus three percentage points of the material's optimum moisture.
- C. Uniformly grade backfilled areas to match existing undisturbed surrounding grade or required finish subgrade elevations (as applicable).

3.06 SURFACE STABILIZATION

- A. The Contractor is responsible for temporary surface stabilization (including seeding) of completed backfilled areas as specified in Section 02125.

3.07 PROTECTION

- A. Protect backfilled areas from traffic and erosion. Backfilling and grading shall be sequenced to minimize disturbance of completed areas.
- B. Where completed areas are disturbed by subsequent project operations or adverse weather during the Remediation Contractor's activities, fill and reshape eroded areas as required until acceptance of the Work.

END OF SECTION