Appendix C – Project Manual

Project Manual

Roswell Environmental/Public Works Department

ITB#: 17-095-L

East Alley Pathway Improvements

Roswell, Georgia

May 31, 2017

TABLE OF CONTENTS

SERIES 00 DOCUMENTS – PROCUREMENT AND CONTRACTING REQUIREMENTS

PROCUREMENT REQUIREMENTS

CONTRACTING REQUIREMENTS

SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

END OF TABLE OF CONTENTS

ISSUED	**DATE**
Bid Package	05-19-17
Addendum 2	07-14-17

(April 2009)

Fact Sheet #66: The Davis-Bacon and Related Acts (DBRA)

This fact sheet provides general information concerning DBRA.

Coverage

DBRA requires payment of prevailing wages on federally funded or assisted construction projects. The Davis-Bacon Act applies to each federal government or District of Columbia contract in excess of $2,000 for the construction, alteration, or repair (including painting and decorating) of public buildings or public works. Many federal laws that authorize federal assistance for construction through grants, loans, loan guarantees, and insurance are Davis-Bacon "related Acts." The "related Acts" include provisions that require Davis-Bacon labor standards apply to most federally assisted construction. Examples of "related Acts" include the Federal-Aid Highway Acts, the Housing and Community Development Act of 1974, and the Federal Water Pollution Control Act.

Basic Provisions/Requirements

Contractors and subcontractors must pay laborers and mechanics employed directly upon the site of the work at least the locally prevailing wages (including fringe benefits), listed in the Davis-Bacon wage determination in the contract, for the work performed. Davis-Bacon labor standards clauses must be included in covered contracts.

The Davis-Bacon "prevailing wage" is the combination of the basic hourly rate and any fringe benefits listed in a Davis-Bacon wage determination. The contractor's obligation to pay at least the prevailing wage listed in the contract wage determination can be met by paying each laborer and mechanic the applicable prevailing wage entirely as cash wages or by a combination of cash wages and employer-provided bona fide fringe benefits. Prevailing wages, including fringe benefits, must be paid on all hours worked on the site of the work.

Apprentices or trainees may be employed at less than the rates listed in the contract wage determination only when they are in an apprenticeship program registered with the Department of Labor or with a state apprenticeship agency recognized by the Department.

Contractors and subcontractors are required to pay covered workers weekly and submit weekly certified payroll records to the contracting agency. They are also required to post the applicable Davis-Bacon wage determination with the Davis-Bacon poster (WH-1321) on the job site in a prominent and accessible place where they can be easily seen by the workers.

Davis-Bacon Wage Determinations

Davis-Bacon wage determinations are published on the Wage Determinations On Line (WDOL) website for contracting agencies to incorporate them into covered contracts. The "prevailing wages" are determined based on wages paid to various classes of laborers and mechanics employed on specific types of construction projects in an area. Guidance on determining the type of construction is provided in All Agency Memoranda Nos. 130 and 131.

Penalties/Sanctions and Appeals

Contract payments may be withheld in sufficient amounts to satisfy liabilities for underpayment of wages and for liquidated damages for overtime violations under the Contract Work Hours and Safety Standards Act (CWHSSA). In addition, violations of the Davis-Bacon contract clauses may be grounds for contract termination, contractor liability for any resulting costs to the government and debarment from future contracts for a period up to three years.

Contractors and subcontractors may challenge determinations of violations and debarment before an Administrative Law Judge (ALJ). Interested parties may appeal ALJ decisions to the Department's Administrative Review Board. Final Board determinations on violations and debarment may be appealed to and are enforceable through the federal courts.

Typical Problems

(1) Misclassification of laborers and mechanics. (2) Failure to pay full prevailing wage, including fringe benefits, for all hours worked (including overtime hours). (3) Inadequate recordkeeping, such as not counting all hours worked or not recording hours worked by an individual in two or more classifications during a day. (4) Failure of to maintain a copy of bona fide apprenticeship program and individual registration documents for apprentices. (5) Failure to submit certified payrolls weekly. (6) Failure to post the Davis-Bacon poster and applicable wage determination.

Relation to State, Local, and Other Federal Laws

The Copeland "Anti-Kickback" Act prohibits contractors from in any way inducing an employee to give up any part of the compensation to which he or she is entitled under his or her contract of employment, and requires contractors to submit a weekly statement of the wages paid to each employee performing DBRA covered work.

Contractors on projects subject to DBRA labor standards may also be subject to additional prevailing wage and overtime pay requirements under State (and local) laws. Also, overtime work pay requirements under CWHSSA) and the Fair Labor Standards Act may apply.

Under Reorganization Plan No. 14 of 1950, (5 U.S.C.A. Appendix), the federal contracting or assistance-administering agencies have day-to-day responsibility for administration and enforcement of the Davis-Bacon labor standards provisions and, in order to promote consistent and effective enforcement, the Department of Labor has regulatory and oversight authority, including the authority to investigate compliance.

Where to Obtain Additional Information

For additional information, visit our Wage and Hour Division Website: http://www.wagehour.dol.gov and/or call our toll-free information and helpline, available 8 a.m. to 5 p.m. in your time zone, 1-866-4USWAGE (1-866-487-9243).

This publication is for general information and is not to be considered in the same light as official statements of position contained in the regulations.

U.S. Department of Labor
Frances Perkins Building
200 Constitution Avenue, NW
Washington, DC 20210

1-866-4-USWAGE
TTY: 1-866-487-9243
Contact Us

Davis-Bacon Act

A federal law that regulates prevailing wage rates on public works projects.

The Davis-Bacon and Related Acts (DBRA) apply to contractors and subcontractors performing on federally funded or assisted contracts in excess of $2,000 for the construction, alteration, or repair (including painting and decorating) of public buildings or public works. The contractors or subcontractors must pay their laborers and mechanics employed under the contract no less than the locally prevailing wages and fringe benefits for corresponding work on similar projects in the area (explained on Standard Form 424B).

Q. When do the wage rules set forth in the Davis-Bacon Act apply to section 319 funds?
A. The Davis-Bacon Act is applicable only to 319 grants that fund construction of treatment works. CWA section 212 defines *construction* and *treatment works* for grants under Title II. Although the section 212 definition can be used as a guide for determining whether a project is a treatment works for purposes of section 319(h) grants, the section 212 definition includes items that may not be "treatment works" in common understanding (e.g., storage facilities that do not provide treatment). For such projects, the Davis-Bacon Act (40 U.S.C§§ 176a–276a-7) requires that wages for laborers and mechanics working on specific, federally funded projects be set at the current wage rate for that region. Specifically, the act requires that each contract over $2,000 for the construction, alteration, or repair of public buildings or public works follow the minimum wages to be paid to various classes of laborers and mechanics employed under the contract.

(1) The term "construction" means any one or more of the following: preliminary planning to determine the feasibility of treatment works, engineering, architectural, legal, fiscal, or economic investigations or studies, surveys, designs, plans, working drawings, specifications, procedures, field testing of innovative or alternative waste water treatment processes and techniques meeting guidelines promulgated under section 1314(d)(3) of this title, or other necessary actions, erection, building, acquisition, alteration, remodeling, improvement, or extension of treatment works, or the inspection or supervision of any of the foregoing items.
(2)(A) The term "treatment works" means any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature to implement section 1281 of this title, or necessary to recycle or reuse water at the most economical cost over the estimated life of the works, including intercepting sewers, outfall sewers, sewage collection systems, pumping, power, and other equipment, and their appurtenances; extensions, improvements, remodeling, additions, and alterations thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities; and any works, including site acquisition of the land that will be an integral part of the treatment process (including land used for the storage of treated wastewater in land treatment systems prior to land application) or is used for ultimate disposal of residues resulting from such treatment.
(B) In addition to the definition contained in subparagraph (A) of this paragraph, "treatment works" means any other method or system for preventing, abating, reducing, storing, treating, separating, or disposing of municipal waste, including storm water runoff, or industrial waste, including waste in combined storm water and sanitary sewer systems.

Any application for construction grants which includes wholly or in part such methods or systems shall, in accordance with guidelines published by the Administrator pursuant to subparagraph (C) of this paragraph, contain adequate data and analysis demonstrating such proposal to be, over the life of such works, the most cost efficient alternative to comply with sections 1311 or 1312 of this title, or the requirements of section 1281 of this title.

https://www.dol.gov/compliance/guide/dbra.htm

https://www.nist.gov/sites/default/files/documents/tip/SF-424b.pdf

https://www.epa.gov/sites/production/files/2015-09/documents/319applying-guide-revised.pdf

https://www.wdol.gov/usrguide/sectionc.aspx#questions

https://www.gpo.gov/fdsys/pkg/CFR-2014-title2-vol1/pdf/CFR-2014-title2-vol1-part200.pdf

https://www.gpo.gov/fdsys/search/pagedetails.action?collectionCode=CFR&searchPath=Title+2%2FSubtitle+A%2FChapter+II%2FSubchap%2FPart+200&granuleId=CFR-2014-title2-vol1-part200&packageId=CFR-2014-title2-vol1&oldPath=Title+2%2FSubtitle+A%2FChapter+II%2FSubchap%2FPart+200&fromPageDetails=true&collapse=true&ycord=798

definition of treatment works:
http://www.waterboards.ca.gov/laws_regulations/docs/fedwaterpollutioncontrolact.pdf

General Decision Number: GA170259 01/06/2017 GA259

Superseded General Decision Number: GA20160259

State: Georgia

Construction Type: Highway

County: Fulton County in Georgia.

HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

SUGA2014-081 10/03/2016

	Rates	Fringes
CARPENTER, Includes Form Work	$ 15.74	0.00
CEMENT MASON/CONCRETE FINISHER	$ 15.33	0.00
FENCE ERECTOR	$ 16.54	0.00
HIGHWAY/PARKING LOT STRIPING: Operator (Striping Machine)	$ 13.25	2.69
INSTALLER - GUARDRAIL	$ 14.95	0.00
INSTALLER - SIGN	$ 13.03	0.00
IRONWORKER, REINFORCING	$ 14.64	0.00
IRONWORKER, STRUCTURAL	$ 15.12	0.00
LABORER: Concrete Paving Joint Sealer	$ 17.66	0.00
LABORER: Grade Checker	$ 11.45	0.00
LABORER: Mason Tender - Brick	$ 11.61	0.00

LABORER: Mason Tender - Cement/Concrete	$ 12.32	0.00
LABORER: Pipelayer	$ 12.34	0.00
LABORER: Asphalt (Includes Distributor, Raker, Screed, Shoveler, and Spreader)	$ 13.87	0.00
LABORER: Common or General, Includes Erosion Control	$ 11.21	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 17.52	2.70
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 13.38	0.00
OPERATOR: Broom/Sweeper	$ 14.83	1.38
OPERATOR: Bulldozer	$ 15.68	1.25
OPERATOR: Compactor	$ 14.64	0.00
OPERATOR: Concrete Saw	$ 18.94	0.00
OPERATOR: Crane	$ 21.08	0.00
OPERATOR: Distributor	$ 16.69	1.01
OPERATOR: Grader/Blade	$ 18.48	0.00
OPERATOR: Hydroseeder	$ 15.20	0.00
OPERATOR: Loader	$ 13.64	0.94
OPERATOR: Mechanic	$ 19.01	0.00
OPERATOR: Milling Machine Groundsman	$ 13.43	1.24
OPERATOR: Milling Machine	$ 17.02	2.39
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 17.03	0.00
OPERATOR: Piledriver	$ 16.70	0.00
OPERATOR: Roller	$ 13.32	0.84
OPERATOR: Scraper	$ 12.64	0.00
OPERATOR: Screed	$ 15.18	1.66
OPERATOR: Shuttle Buggy	$ 14.06	1.98

PAINTER: Spray	$ 23.30	0.00
TRAFFIC CONTROL: Flagger	$ 11.95	0.00
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper	$ 12.66	0.00
TRAFFIC SIGNALIZATION: Laborer	$ 14.00	1.08
TRAFFIC SIGNALIZATION: Electrician	$ 24.72	5.26
TRUCK DRIVER: Dump Truck	$ 16.41	0.00
TRUCK DRIVER: Flatbed Truck	$ 14.91	1.07
TRUCK DRIVER: Hydroseeder Truck	$ 16.74	0.00
TRUCK DRIVER: Lowboy Truck	$ 18.98	0.00
TRUCK DRIVER: Off the Road Truck	$ 12.38	0.00
TRUCK DRIVER: Pickup Truck	$ 13.29	0.00
TRUCK DRIVER: Water Truck	$ 13.23	0.00
TRUCK DRIVER: Semi/Trailer Truck	$ 16.26	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a

new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general requirements of the Contract.

1.2 GENERAL REQUIREMENTS

A. General: The Contractor shall have full use of premises for construction operations, including use of project site, during construction. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project and conditions of any easement or right-or-way occupancy permits.

B. Prior to commencement of Work, the Contractor shall review the construction site with the Owner's representative to make permanent record of such existing damage as cracks, malfunctioning utility equipment and fixtures, or other similar damage. This record shall serve as a basis for determination of subsequent damage to the structures and adjacent areas due to Contractor's operations. Any damage to these structures and adjacent areas not noted in original review record shall be reported immediately to Owner. Permanent record shall include photographs and/or video graphic recording.

C. Smoking and Fire Precautions: No smoking, fire, or use of any fire- or explosion- producing tools or equipment will be permitted on the premises or at any locations where such may endanger said premises or the current operations thereon.

D. Manufacturers Qualifications: The manufacturers of all materials and equipment used must be approved by the Engineer and regularly engaged in the manufacture of the particular material or equipment for the use and service to which it will be subjected.

E. Compliance with state and local laws: Comply will all applicable requirements of state and local laws and ordinances to the extent that such requirements do not conflict with federal laws or regulations.

F. Protection of public and private property: The Contractor shall be responsible for preservation of and shall take special care in working areas to protect public and private property. The Contractor shall replace or repair at his own expense any damaged water pipes, power and communication lines, or other public utilities, roads, curbs, gutters, sidewalks, drain pipes, drainage ditches, all properties and fixtures (both permanent and temporary), and all plantings, including grass or sod on the site of the work. Leave the site in original or better condition after all cleanup work has been done.

G. Markers: Preserve all surveyed and privately owned markers and monuments; do not remove or disturb any such markers without prior approval from the Owner of the marker. Any removal and replacement of such markers shall be at the expense of the Contractor.

H. Pavement repair and/or replacement: Whenever existing asphalt is removed, backfill same and restore traffic over the disturbed area as quickly as possible by constructing a temporary eight-inch thick surface of Class A, Grade D crushed stone. Add material and otherwise

maintain such surface until the permanent pavement is restored by the Contractor or until the work is accepted.

I. Department of Transportation Permits: The Owner will secure any permits and provide bond as required by any federal, state, and local transportation department for the installation of permanent facilities on highway rights-of-way. All such work shall be coordinated with and be subject to the approval of said transportation department and Engineer. The Contractor shall be responsible for permits and bonding for Work not provided for on the Drawings.

J. Approved Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either EPA or USDA. The use of all such chemicals and the disposal of residues shall be in strict conformance with manufacturer's instructions.

K. Catalog Data for Owners: Provide duplicate complete, bound sets of a compilation of catalog data of each manufactured item of mechanical and electrical equipment used in the Work, for transmittal to the Owner before payment of more than ninety percent (90%) is made. Include descriptive data and printed installation, operating, and maintenance instructions (including a parts list for each item of equipment). Provide a complete double index as follows:
   1. List the products alphabetically by name.
   2. List alphabetically the names of manufacturers whose products have been incorporated in the work, together with their addresses and the names and addresses of the local sales representative.

L. Installation, Testing and Guarantee: Install all materials and equipment exactly in accordance with the manufacturer's recommendations. The completely installed system shall be guaranteed against any and all defects of manufacture, materials, workmanship, or installation for a period of one year from the date of Substantial Completion.

M. Operation and Maintenance of the Systems and Instruction to Owner: Where the specifications for equipment require that a factory service representative provide operation and maintenance instruction to the Owner for that equipment, this service shall be performed by prior arrangement with the Owner after and in addition to the manufacturer's instructions to the Contractor for installation and start-up. The individual performing the instructions to the Owner is to be trained and/or certified by the manufacturer as its authorized operation, maintenance, and service specialist. If the said specialist is not a regular, full-time employee of the manufacturer, the specialist's qualifications shall be submitted to the Owner for review and approval prior to scheduling the site visit for instructions to the Owner.

N. Drawings of Record: Provide and keep up-to-date a complete record set of drawings, which shall be corrected daily to show every change. Keep this set of prints at the job site, and use only as a record set. This shall not be construed as authorization for the Contractor to make changes in the approved layout without definite instructions in each case. Turn the set over to the Owner upon completion of the project.

O. Preservation of Existing Vegetation: Take reasonable care during construction to avoid damage to vegetation. Where the area to be excavated is occupied by trees, brush, or other uncultivated vegetable growth, clear such growth from the area, and dispose of it in a manner satisfactory to the Owner. Leave undisturbed any trees, cultivated shrubs, flowers, etc.,

situated within public rights-of-way and/or easements through private property but not located directly within excavation limits. Transplant small ornamental trees, cultivated shrubs, flowers, etc., located directly within excavation limits so they may be replaced during property restoration operations. Do not remove or disturb any tree larger than six inches (6") in diameter without the permission of the Owner. Take special precautions (including the provision of barricades and the temporary tying back of shrubbery and tree branches) for the protection and preservation of such objects throughout all stages of construction; the Contractor will be held liable for any damage that may result to said objects from excavation or construction operations. Trim any limbs or branches of trees broken during construction operations with a clean cut, and paint with an approved tree pruning compound. Treat tree trunks receiving damage from equipment with an approved tree dressing.

P. Existing Utilities: The Contractor is to notify Owner of all underground utilities no less than two days in advance of proposed utility interruption before beginning construction in the area. The Contractor is responsible for locating all existing utilities prior to construction and shall carefully protect from damage all utilities in the vicinity of the work at all times. The Contractor shall be responsible for repairing any utilities that were properly located and marked. If it is necessary to repair, remove, and/or replace any such utility in order to complete the work properly, do so in compliance with the rules, regulations, and approval of the particular utility involved. Any such work shall be considered incidental to the construction or repairs of utility lines, and no additional payment will be allowed therefor. Existing utilities shall remain in service at all times during construction. Contractor shall provide any temporary piping necessary to maintain utility service to existing customers.

Q. Contractor shall be at minimum a Georgia Certified Utility Contractor with a Georgia Contractors License. Contractor shall comply with the requirements of the Manual on Uniform Traffic Control Devices published by the U.S. Department of Transportation Federal Highway Administration in supplying adequate signage, flagging, personnel, etc. for the entire project. The Contractor shall be responsible for the placement and removal of all signage. The Georgia Department of Transportation guidelines must be followed when working within state right-of-way.

R. The Contractor shall maintain an acceptable flow of traffic through construction areas. If a roadway must be closed in order to construct the Work, the Contractor shall notify local law enforcement, 911 call center, local school superintendent, and U.S. Postal Service, at a minimum, at least two days prior to roadway closure.

S. Work in Right-of-Ways:
1. The Contractor shall notify the authorities having jurisdiction prior to entering and working in right-of-ways and shall be responsible for all damages resulting from said Work and for satisfying the requirements of said authorities.
2. The Contractor shall maintain a suitable and safe condition throughout the right-of-way affected by the Work and provide detours as necessary for public and private traffic.
3. Materials excavated in right-of-ways shall be hauled to a disposal site immediately and shall not be stockpiled in right-of-way.

T. Inspection of Work: The Contractor shall provide full access to the project site at all times for inspection and observation of Work by the Owner, Engineer, and agents of any local, state, or federal agency having jurisdiction.

U. UNCOVERING AND CORRECTING WORK

Uncovering Work

1. If any of the Work is covered contrary to the City's request or to any provisions of this Contract, it shall, if required by the City, be uncovered for the City's inspection and shall be properly replaced at the Contractor's expense without change in the Contract Time.
2. If any of the Work is covered in a manner not inconsistent with Subparagraph 11.1.1 above, it shall, if required by the City, be uncovered for the City's inspection. If such Work strictly conforms with the provisions of this Contract, costs of uncovering and proper replacement shall by Change Order be charged to the City. If such Work does not strictly conform with the provisions of this Contract, the Contractor shall pay the costs of uncovering and proper replacement.

Correcting Work

1. The Contractor shall immediately proceed to correct Work rejected by the City as defective or failing to conform to this Contract. The Contractor shall pay all costs and expenses associated with correcting such rejected Work, including any additional testing and inspections, and reimbursement to the City for services and expenses made necessary thereby, if any.
2. If within one (1) year after Substantial Completion of the Work any of the Work is found to be defective or not in accordance with this Contract, the Contractor shall correct it promptly upon receipt of written notice from the City. This obligation shall survive final payment by the City and termination of this Contract. With respect to Work first performed and completed after Substantial Completion, this one (1) year obligation to specifically correct defective and nonconf orming Work shall be extended by the period of time which elapses between Substantial Comple tion and final completion of the subject Work.
3. Nothing contained in this Paragraph shall establish any period of limitation with respect to other obligations which the Contractor has under this Contract. Establishment of the one (I) year time period relates only to the duty of the Contractor to specifically correct the Work.

City May Accept Defective or Nonconforming Work

1. If the City chooses to accept defective or nonconforming Work, the City may do so. In such event, the Contract Price shall be reduced by the greater of (a) the reasonable cost of removing and correcting the defective or nonconforming Work, and (b) the difference between the fair market value of the Project as constructed and the fair market value of the Project had it not been constructed in such a manner as to include defective or nonconforming Work. If the remaining portion of the unpaid Contract Price, if any, is insufficient to compensate the City for its acceptance of defective or nonconforming Work, the Contractor shall, upon written demand from the City, pay the City such remaining compensation for accepting defective or nonconforming Work.

V. Flood Insurance: The Contractor is required to carry flood insurance for Work which is located in designated flood hazard areas unless insurance is not available.

1.3 OPERATION OF EXISTING UTILITIES

A. The Work shall be performed so as to cause minimum interference or interruption with the normal operation of the existing utilities. The Contractor shall plan and conduct construction sequencing operations to avoid disturbing existing utilities and equipment, except as may be provided or approved by the Engineer.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Project Identification:
   1. East Alley Pathway Improvements

B. Owner: City of Roswell, Georgia, Environmental/Public Works Department, 38 Hill Street, Roswell, GA 30075
   1. Owner's Representative: Mr. Sam Bennett

C. Architect: Gresham, Smith and Partners, 2325 Lakeview Parkway, Suite 300, Alpharetta, GA 30009
   1. "Architect" and "Engineer" are used interchangeably.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The work of the Project is defined by the Contract Documents and consists of the following:
   1. Establishment and maintenance of Erosion Prevention and Sediment Control (EPSC) measures.
   2. Phasing and access management to accommodate existing businesses.
   3. Traffic control throughout the duration of the Project.
   4. Demolition.
      a. Existing pavement.
      b. Existing utilities to be replaced.
      c. Underground septic system.
   5. Grading.
   6. Storm drainage installation.
   7. Sanitary sewer installation.
      a. Main line piping and manholes to be supplied by Owner.
   8. Water distribution piping installation.
   9. Natural gas utility installation per Utility Company specifications and drawings.
   10. Underground electric and communications utility trenching and backfilling.
      a. Conduit, utility, transformers, and meters to be installed under separate contract.
      b. Coordinate utility installation
   11. Site lighting.
   12. Installation of paving systems.
      a. Permeable paver system.
      b. Brick paver system.
      c. Concrete paving and striping.
      d. Asphalt paving repair as needed.
   13. Miscellaneous concrete work, including curbs, knee walls, stair landings, and utility pads.

14. Compactor pad and screen wall.
    a. Compactor equipment and guide rails to be installed under separate contract.
15. Site furnishings including but not limited to trash cans, bike racks, and bus stop.
16. Landscaping installation.
    a. Trees to be supplied by Owner.

B. Type of Contract: Project will be constructed under the Contract Agreement Form between Owner and Contractor, and General Conditions. (At Owner's discretion, this Contract may be assigned to a Construction Manager [CM].)

C. Coordinate the Work of this Contract with work performed by Owner. Cooperate fully with Owner so work may be performed without interfering with or delaying work under this Contract or work by Owner.

1.3 WORK UNDER SEPARATE CONTRACTS

A. The Owner will contract separately for the following work for the Project. Portions of that work may occur during Work of this Contract.
1. Items noted on Drawings as "NIC" [Not In Contract] or "OSOI" [Owner-Supplied, Owner-Installed].
2. Underground electric conduits and utilities for primary and secondary services, transformers, and metering equipment.
3. Underground communications conduits, utilities and service equipment.
4. Compactor equipment and guide rail installation.

B. Owner reserves the right to place and install furnishings and equipment in areas of the Work before Substantial Completion of the Work, provided such placements do not interfere with completion of the Work. Such placement of furnishings or equipment shall not constitute acceptance of the Work for areas where furnishings or equipment are placed.

C. Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.4 OWNER- SUPPLIED, CONTRACTOR-INSTALLED (OSCI) PRODUCTS

A. Owner Responsibilities:
1. Provide Product Data, Shop Drawings, Samples, and other submittals to Contractor.
2. Provide copies of manufacturer installation instructions, MSDS and other safety information.
3. Arrange and pay for delivery to site.
4. Notify Contractor of scheduled delivery dates.
5. Inspect delivered products jointly with Contractor.

6. Submit claims for transportation damage, and replace damaged, defective, and missing items.
7. Arrange for manufacturer warranties, inspections, and service.

B. Contractor Responsibilities:
1. Review Owner-provided submittals for compatibility, installation, and use requirements. Notify Architect and Owner of issues that relate to coordination or scheduling.
2. Designate scheduled delivery dates for Owner-supplied products in construction schedule as earliest possible date, unless otherwise informed by Owner.
3. Receive, unload, handle, and store delivered products; inspect jointly with Owner for completeness and damage.
4. Protect Owner-supplied products against loss and damage after receipt.
5. Install and otherwise incorporate Owner-supplied products into the Work.
6. Repair or replace items damaged after delivery.

A. Products supplied by Owner for installation by Contractor:
1. Items noted as 'OSCI' [Owner-Supplied, Contractor-Installed].
2. Sanitary sewers installation. Main line pipes and manholes will be supplied by Owner. Contractor will supply all other materials for sewer installation, including service connections and incidental service line repairs.
3. Landscaping installation. Trees will be supplied by Owner. Contractor will supply shrubs, turf and grasses.

1.5 COORDINATION WITH OCCUPANTS

A. Full Business Occupancy: Businesses will occupy existing adjacent buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Businesses' usage. Perform the Work so as not to interfere with Businesses' day-to-day operations. Maintain existing exits unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Businesses' normal operations and use.
3. Contractor must provide continuous pedestrian access from the alley side of the businesses along Canton Street and Elizabeth Way to the temporary dumpsters on Elizabeth Way and Norcross Street. This access is to be used by employees of the businesses along canton Street and Elizabeth Way for trash removal and deliveries.
4. Contractor shall be responsible for any claims filed for business loss due to contractor delays and/or defective installations.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal City of Roswell construction working hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday, unless otherwise indicated. Application for permits for work outside of this time frame may be approved by the City of Roswell Chief Building Inspector.
   1. Hours for Utility Shutdowns: outside of affected business operating hours.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Architect and Owner not less than seven days in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruptions with Owner.
   1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Alcoholic Beverages: Consumption of alcoholic beverages on Project site is prohibited.

1.7 CONSTRUCTION PERSONNEL

A. Employee Identification: Provide identification tags for Contractor personnel working on Project site and for vehicles. Require personnel to use identification tags at all times.

B. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

C. Contractor is responsible for enforcing good behavior of its employees, subcontractors, and other persons participating in the Work. Contractor shall immediately remove disorderly persons from the premises. Owner shall have the right to require the removal of objectionable persons from the premises at its sole discretion.
   1. Drug use or consumption of alcoholic beverages is prohibited.
   2. Clothing with derogatory depictions, language, or slogans regarding alcohol, drugs, or race, or that are sexual in nature is prohibited.
   3. Obscene language, or derogatory speech regarding race, sex, or religion is prohibited.

1.8 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

A. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Project Manual: The Project Manual comprises written documents for the Work in one or more volumes that include Specifications issued under the professional seals of the Architect and its consultants, and documents prepared by the Owner or other entities for which the Architect has no responsibility. The Project Manual may contain documents such as bidding requirements and information available to bidders that are not Contract Documents.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Owner Documents: Certain bidding and contracting documents and specifications included in the Project Manual documents were prepared by the Owner. These documents were included in the Project Manual without modification by Gresham Smith and Partners and are not issued under the seals of the Architect or its consultants.

i. Some Owner Specification sections may include cross references to specification sections that are not being provided for this Project and do not apply to the Work of Contract.

ii. Send requests for Information relating to Owner documents directly to the Owner's designated Project representative with a copy to the Architect. The Owner will respond to such RFIs.

iii. No provision in the Owner's documents shall be effective to change the duties and responsibilities of Gresham, Smith and Partners from those stated in the Owner-Architect Agreement.

iv. Gresham, Smith and Partners is not responsible for enforcing provisions of Owner documents relating to construction safety.

D. "Section Includes," "Summary," and similar introductory information are included in Specification sections only for convenience of reference by readers, and no limitation of section content or scope of subcontracts is intended.

E. Cross References: Cross references to Division 01 and other portions of the Specifications are neither exhaustive nor complete, and are intended only for the convenience of readers. No limitation of requirements shall be inferred from the absence of specific cross references.

F. Abbreviations: Abbreviations of technical terms and other lengthy terminology are used on the Drawings, in schedules, and in the Specifications. Some terms are defined in the Specifications at first instance of use. Request explanations of abbreviations from the Architect that are not understood.

G. Graphic Symbols: Request explanations from the Architect for unexplained graphic symbols, cross-hatching, and similar Drawing conventions.

H. Diagrammatic Drawings: Where information is shown diagrammatically, it is the Contractor's responsibility to determine actual sizes of the products to be installed and to coordinate locations with other construction to provide adequate clearances for maintenance access and optimum performance.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements governing Allowances.

1.2 WEATHER ALLOWANCE

A. Included within the completion period for this project are a specified number of "bad weather" days according to Figure 2 below.

B. The Contractor's progress schedule shall clearly indicate the bad weather day allowance as an "activity" or "activities". In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor's scheduled workday, that day shall be declared unavailable for work due to weather (a "bad weather" day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor's current progress schedule.

C. Rules for bad weather impacts to the construction schedule will be as follows:

1. The total amount of precipitation that occurs during one calendar month.
    a. If the amount of precipitation in a given month is less than the average precipitation for that month, as stated in Figure 1, no claim will be allowed under this rule. If the average inches of precipitation for the month is exceeded, the number of days having precipitation greater than one tenth (0.10") inch that is greater than the average number of precipitation days per month in Figure 2, is considered to be justification for a one day time extension for each day in excess of the average number of precipitation days.
2. The frequency of the occurrences of precipitation during one calendar month.
    a. Precipitation of greater than one tenth (0.10") inch per day for three or more days of a consecutive five day period is considered to be unusual frequency and, as such, is considered to be justification for a one day extension. This rule can be used even when Rule Number One is not applicable, but may not apply concurrently with other rules.
3. Unusually heavy precipitation.
    a. Precipitation of greater than one inch during a single day is considered to be justification for a one day time extension. For each "heavy precipitation" day or period of consecutive days, a one-day time extension may be allowed for the following day as a "mud day." This rule is applicable only after the precipitation for the month exceeds the normal precipitation for that month as stated in Figure 1.
4. Temperature
    a. Temperatures which do not rise above 32 degrees F by 12:00 PM are considered to be justification for a one day time extension. Temperatures which do not rise above that specified for the day's construction activity by 12:00 PM are considered to be justification for a one day time extension. Temperatures that exceed the specified limit and prevent the day's construction activities are considered to be justification for a one day time extension. This rule cannot be applied concurrently with any other rule.
5. Bad weather credit.
    a. If the number of days in a calendar month with precipitation greater than one tenth (0.10") inch is less than the average number of precipitation days per month listed

in Figure 2, the days shall be credited to the project and the total weather delay tally shall be reduced by this number of days.

Normal Precipitation (all measurements are in inches)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4.50	4.47	4.97	3.43	4.10	4.55	5.38	4.18	4.11	3.41	4.23	4.13

Figure 1

Average Number of calendar days with Precipitation of 0.1 inches or more

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
7	7	7	6	7	8	8	6	5	5	7	7

Figure 2

D. The closest NOAA reporting station to the jobsite is Atlanta DeKalb Peachtree Airport, station ID GHCND: USW00053863. This is the station to be utilized for the monthly analysis. Shortly after the monthly data is available, the Owner will review it in accordance with the rules above and provide a summary advising if additional days are due or not due for the period.

1.3 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust Allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the Allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable Allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the Allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost Allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the Allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES

A. Allowance 1: Weather Allowance. Included within the completion period for this Project are the number of "bad weather" days as indicated in Figure 2 above for the period of months during the Work.

B. Allowance 2: Include Quantity Allowance of 150 cu yd of unsatisfactory soil excavation and disposal off-site and replacement with satisfactory soil material from off-site, as specified in Section 31 2000.

C. An early completion incentive of $1000.00 per day up to a maximum of $15,000.00 (15 days) is available subject to substantial completion of all the work for the project to the satisfaction of the City.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for measurement and payment.

B. Measurement for payment on a unit price basis shall be as described herein. Payment for each item installed shall be made according to the unit price bid, as listed on the Bid Form. Only those items appearing on the Bid Form will be considered for payment on a unit price basis.

C. For work items included in the technical specifications and not listed herein, such work shall be considered part of or incidental to its related work.

D. Pay items for the work for which contract lump sum payment will be made are listed on the Bid Form and briefly described herein. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be considered incidental to the pay items and the cost of such shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all labor, materials, machinery, equipment, tools, apparatus, service, and other necessary supplies and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

E. When actual field conditions differ from assumed design conditions and result in a reduction in materials, equipment, and appurtenances to be installed, a negative adjustment will be made to the Contract. If items are provided on the bid form these items will be used for adjustment, otherwise, the Contractor shall provide costs for a Change Order.

F. The Contractor shall furnish all necessary labor, materials, machinery, equipment, tools, apparatus, service, and other necessary supplies and perform all work shown on the Drawings and/or described in the Specifications at the price listed on the Bid Form. The Work shall be complete-in-place and ready for operation.

G. The Contractor has become thoroughly familiar with the terms and conditions of the Bidding Documents and with local conditions affecting the performance and costs of the Work at the place where the Work is to be completed, and has fully inspected the site in all particulars informing himself fully regarding all conditions pertaining to the Work site.

H. Regular payments to the Contractor by the Owner are contingent upon:
   1. The Project being on schedule to finish by the Completion date.
   2. If not on schedule to finish by the Completion date, the Contractor having a plan approved by the Owner to get the project back on schedule.
   3. If not on schedule to finish by the Completion date, the Owner accepting the estimated delay in schedule.

1.2 SCHEDULE OF PAY ITEMS

A. Section 01 3233 – Photographic Documentation: Photographic Documentation is not a pay item.

B. Section 01 5000 – Temporary Facilities and Controls: Temporary facilities, including multiple types of construction fencing and pedestrian access, temporary dumpster locations, and traffic control is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.

C. Section 01 5713 – Temporary Erosion Prevention and Sediment Control:
   1. Erosion and sediment control is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.
   2. Dewatering is not a pay item.

D. Section 03 3053 – Miscellaneous Cast-in-Place Concrete:
   1. Cast-in-place concrete is not a pay item when used in conjunction with concrete encasement and concrete caps.
   2. Cast-in-place concrete is not a pay item when used in conjunction with concrete blocking and anchoring for water lines.
   3. Cast-in-place concrete is not a pay item when used in conjunction with concrete sidewalk replacement, concrete curb replacement, or concrete gutter replacement.

E. Section 26 0500 – Common Work Results for Electrical: Common Work Results for Electrical is not a pay item.

F. Section 26 0810 – Electrical Testing: Electrical Testing is not a pay item.

G. Section 26 5613 – Lighting Poles and Standards is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, setting bed, concrete base, and equipment required to complete the item in accordance with the Bidding Documents.

H. Section 31 1000 – Site Clearing:
   1. Site Clearing is not a pay item for the purposes of removing existing vegetation, stripping and stockpiling topsoil.
   2. Site Clearing is a pay item for the purposes of removing existing hardscape, pavement, and utilities. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item including all labor, materials, haul-off, disposal, and equipment required to complete the item in accordance with the Bidding Documents.

I. Section 31 2000 – Earth Moving:
   1. Earthwork is not a pay item. All earthwork, excavation, haul-off, disposal, backfill, and compaction related to utility lines and appurtenances shall be unclassified. All earthwork and excavation related to vaults, site grading, paver base, excavation, over-excavation, haul-off, disposal, backfilling, and compaction shall be unclassified.

2. Over-excavation as directed by the Engineer for unsatisfactory materials is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item including all labor, materials, haul-off, disposal, backfilling, compaction, and equipment required to complete the item in accordance with the Bidding Documents.

J. Section 31 2319 – Dewatering: Dewatering is not a pay item.

K. Section 31 5000 – Excavation Support and Protection: Excavation support and protection is not a pay item.

L. Section 32 1216 – Asphalt Paving:
1. Hot mix asphalt pavement repair due to temporary dumpster facilities and service lane on existing roadways is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.
2. Hot mix asphalt pavement repair due to Contractor performed Work, and markings is not a pay item.

M. Section 32 1313 – Concrete Paving:
1. New pavement, pads, curbs, and markings is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.
2. Concrete paving is not a pay item when used in conjunction with concrete sidewalk replacement, concrete curb replacement, or concrete gutter replacement.

N. Section 32 1373 – Concrete Paving Joint Sealants: Joint sealants is not a pay item.

O. Section 32 1400 – Unit Paving: Brick pavers is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, setting bed, concrete base, and equipment required to complete the item in accordance with the Bidding Documents.

P. Section 32 1413 – Interlocking Precast Concrete Pavers: Pavers, base stone, underdrains, geotextile, and liners is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.

Q. Section 32 8400 – Planting Irrigation: Irrigation systems is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.

R. Section 32 9200 – Turf and Grasses: Lawns and grasses is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.

S. Section 32 9300 – Plants: Plants is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents. Trees will be provided by the Owner. All other plants to be provided by Contractor. All plant materials to be installed by Contractor.

T. Section 33 1100 – Water Utility Distribution Piping: Water utility distribution piping, fittings, taps and service assemblies, meters, and backflow preventers is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.

U. Section 33 3113 – Sanitary Sewers (Gravity): Sanitary sewers (gravity) is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents. Main line 8" ductile iron pipe and manholes will be provided by the Owner. All other materials, services connections, and incidental service piping to be provided by Contractor.

V. Section 33 4000 – Storm Drainage: Storm drainage is a pay item. Payment for this work shall be as specified on the Bid Form and be considered as full compensation for this item, including all labor, materials, and equipment required to complete the item in accordance with the Bidding Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

- Changes in the Contract

(a) Changes in the Work: The Owner may at any time, as the need arises, order changes within the scope of the Work without invalidating the Contract Agreement. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the Work, an equitable adjustment will be authorized by Change Order.

The Engineer, also, may at any time, by issuing a field order, make changes in the details of the Work. These changes by field order will not affect Contract Time or Contract Price. The Contractor shall proceed with the performance of any changes in the Work so ordered by the Engineer, unless the Contractor believes that such field order entitles Contractor to a change in Contract Price or Contract Time or both, in which event Contractor shall give the Engineer immediate, written notice thereof and if required by the Owner, an immediate estimate of the direct cost of Work as outlined in (b) below; after the receipt of the ordered change, and the Contractor shall not execute such changes pending the receipt of an executed Change Order or further written instruction from the Owner.

Should the Contractor encounter, or the Owner discover, during the progress of the Work, subsurface or latent conditions at the site materially differing from those shown on the Drawings or indicated in the Specifications, or unknown conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Drawings and Specifications, the Owner shall immediately be notified in writing of such conditions before they are disturbed. The Owner will thereupon promptly investigate the conditions. If the Owner finds that conditions do so materially differ, or are of an unusual nature, and upon written request of the Contractor, an equitable adjustment will be authorized by Change Order.

If the Contractor does not immediately notify the Owner in writing of the belief that a field order, additional work by other contractors or the Owner, or subsurface, latent or unusual unknown conditions entitles the Contractor to a Change Order, no consideration for time or money will be given the Contractor.

The Owner may, with the Contractor's concurrence, elect to postpone the issuance of a Change Order until such time that a single Change Order of substantial importance can be issued incorporating several changes. In such cases, the Owner will indicate this intent for each change in the Contract in a written response to the Contractor's request for a change, following agreement by the Owner and Contractor on the change's scope, price and time.

(b) Changes in Contract Price: The Contract Price may be changed only by a Change Order. The value of any Work covered by a Change Order for increase or decrease in the Contract Price will be determined by one or more of the following methods, in the order of precedence listed below:

(1) By estimating the number of unit quantities of each part of the Work which is changed (either increased or decreased) and then multiplying the estimated number of such unit quantities by the price Bid (which price shall include the Contractor's overhead and profit) for a unit quantity thereof.

For the Work performed in item (2) or (3) above, payment will be made for the documented actual direct cost of the following:

(aa) Labor, including foremen, for those hours they are assigned and participating in the Work covered by the change order (actual direct payroll cost of wages). The Contractor shall furnish, if required by the Owner, certified payrolls to verify wages. All labor related costs will be included in a 30 percent markup of the cost of direct payroll wages. This refers to the Contractor's specific labor wages.

(bb) Material delivered and used on the designated Work, including sales tax, if paid for by the Contractor and as verified by original invoices or otherwise verifiable to the Owner's acceptance.

(cc) Rental, or ownership cost of equipment, including necessary transportation of equipment, having a purchase value in excess of $300.00. Rental or ownership cost will be allowed for only those hours during which the equipment is required on the project site. Cost allowances will not exceed the rates defined as follows: the hourly rate, for equipment not used exclusively in the change to the scope of work, will be the monthly rate, as printed in the current Rental Blue Book for Construction Equipment published by Equipment Watch, a unit of Penton Media, Inc., divided by 176; the rate, for equipment used exclusively for those tasks identified in the change to the scope of work, will be the daily, weekly or monthly rate, used singularly or in combination, which will provide the lowest total cost. The rates will be modified by the Rate Adjustment Table factors to reflect a depreciation allowance indexed to the year a machine was originally manufactured and sold. The rates will be adjusted to account for regional differences in annual use hours, cost of labor, freight, taxes, etc. The amount by which basic rates will be increased or decreased is shown on the adjustment maps included in the "Blue Book".

The equipment use period will begin only at the time equipment is unloaded at the site of the changed work, will include each day that the equipment is required at the site of the changed work and will terminate at the end of the day on which the use of such equipment becomes unnecessary, plus reasonable transportation time. The maximum time to be paid per day will not exceed eight hours unless the equipment is in operation for a longer time. The time which will be paid for per day, for equipment not used exclusively in the change to the scope of work, will be the hours which the equipment was actually in operation on the changed work.

In addition to the actual costs in items (aa) through (cc) above, there will be, for the Contractor actually performing the work, a fixed fee of 16 percent for bond, insurance, overhead and profit added to the cost of Items (aa), (bb) and (cc), above.

If all or a portion of the Change Order is performed by a subcontractor, payment will be made for the documented actual direct cost as outlined in (aa), (bb) and (cc), above. A fixed fee of 16 percent for bond, insurance, overhead and profit will be added to the cost of (aa), (bb) and (cc) of the subcontractor's work only.

A fixed fee of 10 percent will be added to the subcontractor's Work for the Contractor's administrative handling of portions of the Work that are performed by an approved subcontractor. No additional fixed fee will be allowed for the Contractor's or a subcontractor's administrative handling of Work performed by a subcontractor's subcontractor, unless by written permission from the Owner. All other costs not specifically listed above are considered to be included in the fixed fee.

(4) The Contractor shall, when required by the Owner, furnish the Owner with an itemized breakdown of the quantities and prices used in computing the value of any change that might be ordered, in a printed format, and with sufficient detail as required by the Owner.

(c) Changes in Contract Time: The Contract Time may be changed only by a Change Order. Changes in the Work described in (a) and any other claim made by the Contractor for a change in the Contract Time will be evaluated by the Owner with the assistance and input of the Engineer and if the conditions warrant, an appropriate adjustment of the Contract Time will be made.

The Owner, when making these evaluations will take into consideration the amount and scope of Work which has been changed and will evaluate if the change in Work has affected the critical path as currently accepted on the progress schedule such that it would delay the completion of the Project. If after these evaluations have been made and in the sole opinion of the Owner, the Contractor is due an extension of time, then it will be granted by a Change Order and the Owner will pay the associated cost due the Contractor for direct field costs, only as outlined under Changes in Contract Price (aa) and (cc), exclusive of Item (bb), based on any delays to the overall Project. Extensions of time granted as a result of weather will not result in a change in Contract Price.

Article 30 - Payments and Completion

(a) Contract Price: The Contract Price is either a lump sum or the sum of the unit prices, or a combination thereof, stated in the Contract Agreement, for each item multiplied by the actual quantities installed of each item, and is the total amount payable by the Owner to the Contractor for the performance of the Work set forth in the Contract Documents.

It is understood that the Contractor shall provide and pay for all products, labor (including labor performed after regular working hours, on Sundays, or on legal holidays), equipment, tools, water, light, power, sewer, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, place into operation, and deliver the Work.

It is further understood that the Contractor's proposed construction schedule is based on a normal 40 hour, 5 day work week, less recognized holidays. If the Contractor desires to work in excess of this limit, the Contractor shall submit a written request to the Owner a minimum of five days prior to the desired work date. The Contractor shall be responsible for any additional expenses incurred by the Owner as a result of the extended work hours, including resident inspection overtime. The cost associated with resident inspector overtime will be deducted from the Contractor's monthly payment request.

(b) Breakdown of Cost: Before the first application for payment the Contractor shall submit to the Engineer a breakdown of cost for the various portions of the Work, including quantities if required by the Engineer, aggregating the total Contract Price prepared in such form as specified or as the Engineer and the Contractor may agree upon and supported by such data to substantiate its correctness as the Engineer may reasonably require. This schedule of values, when approved by the Engineer, will be used only as a basis for the Contractor's application for payment; however, the payment schedule will correlate directly with the Overall Project Schedule (OPS) cost information, when applicable.

(c) Progress Payments: At the end of each calendar month, the Contractor shall submit to the Engineer an itemized application for payment supported by such other substantiating data as the Engineer may reasonably require covering Work completed through the 25th day of the month. Any progress payment submitted by the Contractor after the fifth of the month will be included in the following month's payment.

Application for payment may include, at the Contractor's option, the cost of products not yet incorporated into the Work which have been delivered to the site or to other storage locations authorized and approved by the Engineer. The Owner reserves the right to accept or reject pay requests for stored materials, and to limit payments to those stored materials which, in the Engineer's judgment, are necessary for continuing satisfactory Project progress.

Payment for stored products will be subject to the following conditions being met or satisfied:

(1) The products shall be received in a condition satisfactory for incorporation in the Work, including manufacturer's storage and installation instructions.

(2) The products shall be stored in accordance with the manufacturer's recommendations and in such manner that any and all manufacturer's warranties will be maintained and that they will not be damaged due to weather, construction operations or any other cause.

(3) An invoice from the manufacturer shall be furnished for each item on which payment is requested. The request may include reimbursement for cost of delivery, limited to common carrier rates, to the site, but will not include the Contractor handling, on or off site, or for storage expense.

(4) The Contractor shall, on request of the Engineer, furnish written proof from the supplier of payment (less retention equal in percentage to that being retained by the Owner) for the products no later than 30 days after receipt of payment for same from the Owner. The Owner will have the right to deduct from the next payment estimate an amount equal to the payment for the products if reasonable and adequate proof is not submitted.

(5) Shop drawings, product data and samples, showing "No Exceptions Taken", have been received from the Contractor for that specific equipment or material.

The Contractor warrants that title to all Work and products covered by an Application for Payment, whether incorporated into the Project or not, will pass to the Owner upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances (except retention equal in percentage to that being retained by the Owner which may be withheld from suppliers and subcontractors to guarantee completion and performance).

(d) Certificate for Payment: If the Contractor has made application for payment as provided above, the Engineer will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Engineer determines to be properly due, or the Engineer will state, in writing, itemized and specific reasons for withholding a Certificate as provided herein.

After the Engineer has issued a Certificate for Payment, the Owner will pay to the Contractor the amount covering Work completed plus stored products, less retention and less previous payments made.

No certificate for a progress payment, nor any progress payment, nor any partial or entire use of occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

(e) Retention:

(1) The Owner will retain the following amounts from each properly certified estimate:

(a) Until the value of the Work completed, including stored materials, is at least 50 percent of the Contract amount, 10 percent of the value of all Work satisfactorily completed, including stored materials.

(b) When the value of the completed Work totals at least 50 percent of the Contract amount, the Owner will discontinue retaining additional amounts provided the Work is progressing satisfactorily and there is no specific cause for retaining a larger sum. The total amount retained will be at least 5 percent of the Contract amount, adjusted for Change Orders, until the date of final payment.

(c) The Owner may elect to reinstate retention of 10 percent of the value of the Work completed if at any time the Contractor fails to make satisfactory

progress or if there is other specific cause. Satisfactory progress is identified as conforming to the construction progress schedule as required in Article 24, as modified by the Supplementary Conditions.

(2) No form of collateral in lieu of cash will be acceptable as retainage.

(3) Amounts retained by the Contractor from payments due to suppliers and subcontractors (expressed as a percentage) shall not exceed that being retained by the Owner.

(f) Payments Withheld: The Engineer may decline to approve an Application for Payment and may withhold certificate, in whole or in part, as may be necessary to protect the Owner from loss because of:

(1) Failure of the Contractor to make payments properly to subcontractors or for labor or products.

(2) Unsatisfactory prosecution of the Work by the Contractor either due to quality of the work of if the Contractor is behind the currently approved construction schedule.

When the above reasons for nonpayment are corrected, then payment will be made for amounts withheld because of such reasons, not later than the next payment.

Completion and Final Acceptance shall be as stipulated in the Supplementary Conditions.

END OF SECTION

Part 1 General

1.01 Scope

This section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

1.02 Definitions

A. For the purposes of these Contract Documents, a "substitute item" shall be defined as one of the following:

1. A product or manufacturer offered as a replacement to a specified product or manufacturer.

2. A product or manufacturer offered in addition to a specified product or manufacturer.

B. For the purposes of these Contract Documents, a "substitute construction method" shall be defined as one of the following:

1. A mean, method, technique, sequence or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.

2. A mean, method, technique, sequence or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.03 General

A. An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the Drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item or construction method.

B. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.

C. If the manufacturer is named on the Drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.

D. Whenever the Engineer's design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed first in the list of approved manufacturers in the Specifications. Any Bidder intending to

furnish products of other than the first listed manufacturer, or furnish substitute items, shall

1. Verify that the item being furnished will fit in the space allowed, perform the same functions and have the same capabilities as the item specified,

2. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product,

3. Include the cost of any architectural, structural, mechanical, piping, electrical or other modifications required, and

4. Include the cost of required additional work by the Engineer, if any, to accommodate the item.

E. Whenever a product specification includes minimum experience requirements which the manufacturer selected by the Contractor cannot meet, the manufacturer shall furnish the Owner with a cash deposit, or bond acceptable to the Owner in an amount equal to the cost of the product, which shall remain in effect until the experience requirement has been met.

1.04 Approvals

A. Approval, of a substitution as an acceptable manufacturer, of the Engineer is dependent on determination that the product offered:

1. is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life and other criteria to that on which the design is based, and

2. will require no major modifications to structures, electrical systems, control systems or piping systems.

1.05 Substitutions and Options

A. No substitutions will be considered for the manufacturers listed in the Bid.

B. After Notice to Proceed

1. Substitute items will be considered only if the term "equal to" precedes the names of acceptable manufacturers in the Specification.

2. Where items are specified by referenced standard or specified as indicated above in Article 1.03, Paragraph A, such items shall be submitted to the Engineer for review.

3. The Contractor shall submit shop drawings on the substitute item for the Engineer's review in accordance with the Section 01 33 23.

C. Prior to Opening of Bids

1. No consideration or approvals will be made for products specified by a referenced standard, or specified as indicated in Article 1.03, Paragraph A, above. Such consideration may occur only after the Notice to Proceed.

2. No consideration or approvals will be made for products being offered where the term "equal to" precedes the name of an approved product. Such substitution consideration may occur only after the Notice to Proceed.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information/Interpretation (RFIs).
   4. Project meetings.

B. Related Requirements:
   1. Section 01 7700: Procedures for coordinating closeout of the Contract.

1.2 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare written summary identifying individuals or firms proposed for each portion of the Work, including those who are to supply products or equipment fabricated to a special design. Include the following information in tabular form:

B. Key Personnel Names: Before the start of construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses.

1.3 GENERAL COORDINATION PROCEDURES

A. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.

5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 COORDINATION

A. Coordinate scheduling, submittals, and Work of various Specification sections and Drawing notes to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Coordinate the Work with adjacent businesses to ensure pedestrian access for employees specifically for trash disposal.

C. Coordinate with outside utility contractors to complete utility installation, connection, and testing.

D. Coordinate selection of products specified in different Specification sections for compatibility. Compatibility among Contractor's options is not assured by listed manufacturers or products in the Specifications or Drawings, but must be provided by the Contractor.

E. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities.

F. Coordinate construction operations for efficient and orderly installation of each part of the Work. Coordinate construction operations for Work specified in different Sections that depend on each other for proper installation, connection, and operation. Lay out Work to provide required headroom and width in egress paths.

G. Coordination of installation location and sequence between elements of the Work is a basic Contract requirement. Locations of concealed elements shown on Drawings that connect to exposed elements are intended only as diagrams; final locations are the responsibility of the Contractor within Contract requirements.

H. Locations of access panels shown on Drawings are intended only diagrammatically. Locate access panels to provide convenient and direct location to concealed controls and equipment.

I. Coordinate horizontal and vertical space requirements, support sizes and locations, and installation of Work indicated diagrammatically on Drawings, including concealed spaces. Route concealed pipes, ducts, conduit, and similar items in orderly manner with long dimensions parallel to column grid lines where possible.

J. Coordinate locations of concealed framing, blocking, and other supports with manufacturer requirements for support and anchorage.

K. Utilize spaces efficiently to maximize accessibility for subsequent Work, for maintenance, for repairs, and to permit removal and replacement.

L. Coordinate equipment locations and utility supplies to such locations with manufacturer product information for operational clearances and for maintenance access.

M. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

N. Coordinate enclosure of Work with required inspections and tests to minimize need for uncovering Work for those purposes.

O. Preparation of coordination drawings for work of different trades is Contractor's option. Such drawings will not be reviewed by the Architect.

1.5 REQUESTS FOR INFORMATION OR INTERPRETATION (RFIs)

A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Owner or Architect will return RFIs submitted to Owner by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Submission of an RFI constitutes representation that the Contractor requires additional information about the Contract Documents after having made careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, and prior project correspondence or documentation.

C. If upon evaluation of the RFI the Owner or Architect finds that the requested information is contained in the Contract Documents or by other documents or methods as outlined in paragraph above, the Owner has the option to obtain reimbursement from the Contractor for costs incurred by the Owner for the Architect's services and expenses made necessary in answering such requests.

D. Content of the RFI: Include detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

E. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow at least ten working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include request for additional information or clarification, in which case Architect's time for response will date from time of receipt of additional information or clarification from Contractor.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 2600.
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 working days of receipt of the RFI response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by RFI number. Submit copies of log weekly.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five working days if Contractor disagrees with response.
   1. Include identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. General: The Owner / Engineer shall Schedule and conduct bi-weekly project meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: The contractor must inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
      a. Attendees should include:
         1) City of Roswell on-call contractor
         2) Georgia Power
         3) AT&T
         4) Charter Communications
         5) Southern Company Gas
   2. Agenda: The owner / engineer will prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: The owner / engineer will be responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned within three working days of the meeting.

B. Preconstruction Conference: The contractor shall schedule and conduct preconstruction conference before starting construction, at a time convenient to Owner and Architect, but not later than 15 working days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Record and distribute meeting minutes.
   4. Agenda: Discuss items of significance that could affect progress.
      a. Tentative construction schedule.

b. Phasing.
c. Critical work sequencing and long-lead items.
d. Weather days.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Procedures for processing field decisions and Change Orders.
h. Procedures for RFIs.
i. Procedures for testing and inspecting.
j. Procedures for processing Applications for Payment.
k. Distribution of the Contract Documents.
l. Submittal procedures.
m. Preparation of record documents.
n. Use of the premises and existing building.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

C. Preinstallation Conferences: The contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration.
    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mock-ups.
    i. Possible conflicts.
    j. Compatibility requirements.
    k. Time schedules.
    l. Weather limitations.

m. Manufacturer recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, each contractor, subcontractor, supplier, utility company, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. These meetings are intended to be
4. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) This schedule should include coordination of work by others, including but not limited to:
a) City of Roswell on-call contractor
b) Georgia Power
c) AT&T
d) Charter Communications

e) Southern Company Gas

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
   1) Review schedule for next period.
   2) Include updates for Weather Days.

c. Review present and future needs of each entity present, including the following:
   1) Interface requirements.
   2) Sequence of operations.
   3) Status of submittals.
   4) Deliveries.
   5) Off-site fabrication.
   6) Access.
   7) Site utilization.
   8) Temporary facilities and controls.
   9) Utility coordination updates.
   10) Progress cleaning.
   11) Quality and work standards.
   12) Hazards and risks.
   13) Quality and work standards.
   14) Status of correction of deficient items.
   15) Field observations.
   16) Status of RFIs.
   17) Status of proposal requests.
   18) Pending changes.
   19) Status of Change Orders.
   20) Pending claims and disputes.
   21) Documentation of information for payment requests.

5. Minutes: Record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.
   3. Final completion construction photographs.

B. Related Requirements:
   1. Section 01 7700: Submission of photographic documentation as project record documents at Project closeout.
   2. Section 31 1000: Photographic documentation before starting site clearing operations.

1.2 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three working days of taking photographs.
   1. Digital Camera: Minimum sensor resolution of 8 megapixels.
   2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
   3. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Name of Architect.
      d. Name of Contractor.
      e. Date photograph was taken.
      f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      g. Unique sequential identifier keyed to accompanying key plan.

1.3 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using maximum depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   1. Date and Time: Include date and time in file name for each image.
   2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag construction limits before taking construction photographs.
   2. Take at least 20 photographs to show existing conditions adjacent to property before starting the Work.
   3. Take at least 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
   4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take at least 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take at least 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.

END OF SECTION

ISSUED	DATE
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittals schedule.
   2. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals. The Architect may designate portions of Action Submittals as Informational Submittals at its discretion.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections. The first sequencing schedule should be ready for submittal at the initial kick off meeting for the project.

B. Review Initiation Date: Date submittal is received in the Owner’s office, or the next working day when received after 2 pm local time.

C. Review Completion Date: Date submittal leaves the Owner’s office.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of individual drawing files (not Construction Documents) of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

1. Architect will supply Contractor one set of digital data drawing files requested in writing by Contractor for use in preparing Shop Drawings and Project record drawings.
    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's receipt of submittal. Submittals received after 2 pm local time shall be deemed to be received on the following working day. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow at least 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination or the size and complexity of the submittal.
2. Resubmittal Review: Allow at least 10 working days for review of each resubmittal.

D. Options: Identify options requiring selection by the Owner.

E. Deviations: Identify deviations from the Contract Documents on submittals.

F. Transmittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit submittals for each specification section with a separate transmittal form. Owner will return submittals, without review, received from sources other than Contractor.

G. Resubmittals:

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Approved" or "Approved as Noted" by Owner or Architect.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. Transmit submittals for each specification section separately and as one group, regardless of the number of installers or suppliers, unless otherwise permitted in writing by Owner.

B. General Submittal Procedure Requirements: Submit electronic files for action and informational documents per the following requirements. The Owner or Architect will mark comments and apply its review stamp electronically before returning the files to the Contractor. Contractor is responsible for printing or otherwise distributing reviewed copies of submittals.
   1. File Format: Portable document format [PDF] vector or scanned files; no other format is acceptable. Files must include legible stamps and notations from Contractor's review indicating Contractor's approval as required by the General Conditions.

C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. Submit Product Data before or concurrent with Samples.

D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data**,** unless submittal based upon Architect's digital data drawing files is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 18 by 24 but not larger than 34 by 44 inches.

E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
3. Electronic Submittals: For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

F. Coordination Drawings: Comply with requirements specified in Section 01 3100.

G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000.

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700.

I. Subcontract List: Prepare written summary identifying individuals or firms proposed for each portion of the Work, including those who are to supply products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

L. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

M. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certification, signed and sealed by the responsible design professional licensed in the state in which the project is located, for each product and system specifically assigned to Contractor to be designed or certified by design professional.
   1. Certify that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with Contractor’s approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Contractor’s Approval Stamp: Wording shall clearly indicate the following information. Submittals with review stamps that do not meet these requirements will be rejected without review.
   1. The submittal was reviewed for compliance with Contract requirements.

2. The submittal is marked as "Approved" or "Approved As Noted" per requirements of the Conditions of the Contract.
3. Reviewer identification.
4. Review date.

3.2 OWNER AND ARCHITECT ACTION

A. General: Owner and Architect will not review submittals that do not bear acceptable Contractor's approval stamp and will return them without action.

B. Action Submittals: Owner or Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Owner or Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Approved: Where submittal is marked "Approved", the Work covered by the submittal may proceed provided it complies with the Contract Documents.
   2. Approved as Noted: Where submittal is marked "Approved As Noted", the Work covered by the submittal may proceed provided it complies with both Owner's notations and corrections on the submittal and the Contract Documents.
   3. Revise and Resubmit: Where the submittal is marked "Revise and Resubmit", do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Owner's notations and corrections.
   4. Rejected: Where submittal is marked "Rejected", do not proceed with the Work covered by the submittal. Prepare new submittal that complies with the Contract Documents.

C. Informational Submittals: Owner or Architect will review each submittal and will not return it, or will return it if it is non-responsive to requirements. Owner has authority to designation portions of action submittals as informational.

D. Partial submittals prepared for portion of the Work will be reviewed only when use of partial submittals has received prior approval from Owner.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

ISSUED	DATE
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trades.

J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.

2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer's Technical Representative Qualifications: Authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

D. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Provide sizes and configurations of test assemblies, mock-ups, and laboratory mock-ups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mock-ups using installers who will perform same tasks for Project.
e. Build laboratory mock-ups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mock-ups**,**; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Agent, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
3. Demolish and remove mock-ups when directed unless otherwise indicated.

E. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on Drawings and Specifications. Coordinate installation of exterior envelope materials and products for which mock-ups are required in individual Specification Sections, along with supporting materials.

1. At Contractor's option and at its sole risk, integrated exterior mock-ups may be separate, stand-alone assemblies or sample installations of the Work.
2. Place mock-ups where acceptable to Architect.
3. Provide foundations, bracing, and supports needed for strength and stability.
4. Construct mock-ups using same products, equipment, methods, and work force proposed for final construction and in conformance with relevant Drawings.
5. Alter or remove and reconstruct mock-ups that do not conform to requirements for the Work as necessary to demonstrate conformance.
6. Mock-ups are subject to same testing as final Work.
7. Where noted in specification sections, approved mock-ups may become part of completed Work if in acceptable condition at time of Substantial Completion.
8. Remove stand-alone mock-ups, including temporary foundations, bracing, and supports, from site when acceptable to Architect.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will supply Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Agent and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect, Commissioning Agent, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with minimum delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's , Commissioning Authority's, reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Temporary utilities.
   2. Support facilities.
   3. Security and protection facilities.

B. Related Requirements:
   1. Section 01 1000: Work restrictions and limitations on utility interruptions.
   2. Section 31 2319: Disposal of ground water at Project site.
   3. Section 32 1216: Construction and maintenance of asphalt pavement for temporary roads and paved areas.
   4. Section 32 1313: Construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water Service: Pay water-service use charges for water used by all entities for construction operations.

C. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
   1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.

2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Department of Justice publication *2010 ADA Standards for Accessible Design* as well as Code requirements.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete bases for supporting posts.

C. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Before commencing work, isolate the HVAC systems in area where work is to be performed according to coordination drawings.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service overhead unless otherwise indicated.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

A. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."

B. Temporary Use of Existing Roads and Paved Areas: Locate temporary facilities serving existing businesses as indicated on Drawings.

1. Provide 2 locations for dumpsters on existing paved public roadways. Work includes:
   a. Steel plates under dumpsters to minimize damage to existing asphalt.
   b. Dumpsters to be provided by Owner.
2. Provide temporary service lane on Norcross Street as indicated on Drawings to be used for deliveries to local Businesses during construction.
3. Provide continuous protected walkway pedestrian access from existing buildings' rear service entrances to temporary dumpster locations and temporary delivery service lane.
4. Coordinate with Owner for temporary dumpster locations on Elizabeth Way and Norcross Street and for temporary service lane on Norcross Street.
5. Provide traffic control for temporary facilities in compliance with authorities having jurisdiction.
6. Restore existing roadways to existing conditions at completion of Project. Repair hot-mix asphalt according to Section 321216 "Asphalt Paving.".

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs:
   1. Identification Signs: Provide Project identification signs.
   2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   3. Maintain signs so they are legible at all times.
   4. Political signs and other unauthorized signs are not permitted.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 01 5713.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations as indicated on Drawings.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

I. Walkway: Erect protective walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
   1. Construct walkways using scaffold or shoring framing as necessary.
   2. Provide protective enclosure walls, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   3. Maintain appearance of walkway for duration of the Work.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

B. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work shall include providing erosion prevention and sediment control measures for all excavation and other construction activities within the limits of the site, any temporary or permanent easements, and within any borrow or spoil areas used during the entire duration of construction. During dry weather, sprinkle sites with water or use other means necessary to control dust.

1.2 QUALITY ASSURANCE

A. All erosion prevention and sediment control work shall comply with applicable requirements of governing authorities having jurisdiction and of the National Pollutant Discharge Elimination System (NPDES). The specifications and drawings are not represented as being comprehensive, but rather convey the intent to provide complete erosion prevention and sediment control for the Owner's and adjacent properties. In the event of a discrepancy between these documents and requirements of authorities having jurisdiction, the more stringent of the two shall take precedence.

B. Erosion prevention and sediment control measures shall be provided prior to commencement of construction and diligently maintained for the entire duration of construction. On-site and off-site areas which are especially vulnerable to damage from erosion and sedimentation, are to be identified and receive special attention.

C. All land-disturbing activities shall be planned and conducted to minimize the area and time of exposure and to prevent discharge of sediment laden water from the site.

D. Surface water runoff originating upgrade of exposed areas shall be diverted to reduce erosion and sediment loss during the period of exposure.

E. The Contractor is responsible for removal of sediment from all erosion prevention and sediment control structures, barriers and ponds when capacity of the feature is reduced by one-half or as set forth by authorities having jurisdiction.

F. The Contractor is required to perform inspections and document conditions of erosion prevention and sediment control measures. Frequency of inspection shall be as set forth in the by authorities having jurisdiction. Maintenance shall be performed promptly.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Crushed stone for stabilized construction entrance/exit shall be clean and 2 to 3.5 inches in diameter. Filter fabric for stabilized construction entrance/exit shall be Mirafi 135N or equivalent.

B. Silt fence shall be "Envirofence" preassembled silt fence by Mirafi, Inc., or equivalent. Tensile Strength (Lbs. Minimum) warp 120, fill 100 per ASTM D-4632; Elongation (% Maximum) 40, per ASTM D-4632; Apparent Opening Size #30 per ASTM D-4751; Flow Rate (Gal/Min/Sq. Ft.) 25, Ultraviolet Stability of 80 per ASTM D-4632 after 300 hours of weathering per ASTM D-4355); Bursting Strength (PSI, Minimum) 175 per ASTM D-3786.

C. Gravel Filled Bags: Bags shall be of like material to silt fence. Gravel shall be clean #57 or #67 crushed stone. Filled bags shall be at least 2 feet long, 1'-6" wide and 6 inches thick.

D. Rock for check dam structures shall be clean, small rip rap (2 to 15 inches in diameter).

E. Strawbales: Bales shall be either wire bound or string tied and placed with bindings orientated around sides rather than top and bottom.

G. Temporary Vegetation: Seed mixtures including rye, annual ryegrass, wheat, oats, barley, Sudan grass, wheat, oats, Fescue, Lespedeza, millet, and/or Bermudagrass that provide quick protection shall be used to temporarily stabilize disturbed areas that will not be brought to final grade for 30 days or more.

H. Temporary mulches shall consist of straw or hay, composted materials, wood chips or cellulose fiber, asphalt, and/or rolled erosion control products.

I. Erosion Control Blanket/Matting: Blanket and matting materials shall be non-toxic to vegetation. Netting shall be photodegradable and intertwined with mulch/fiber material. Mulch and fiber material shall consist of straw, excelsior (curled wood), coconut, or jute (woven root fiber).

PART 3 - EXECUTION

3.1 PROTECTION

A. Conduct construction so as to provide the site with maximum protection from erosion at all times.

B. Conduct excavation activities to provide erosion and sediment control as follows:

1. Clearing and excavation shall not commence until such work is approved and permitted by local authorities having jurisdiction. Coordinate with authorities having jurisdiction for permitting requirements.
2. Stockpile excavated material so as not to block any drainage area. Replace this excavated material in the trench immediately after repairs or installations have been completed and are approved by the Architect/Engineer or local authority.
3. Retain natural vegetation whenever feasible.
4. Stabilize exposed areas as quickly as possible by means of seeding and mulching. Use diversion ditches, or other methods, to prevent storm water from running over the exposed area until seeding is established as specified.
5. Take particular care along streams and drainage ditches so that fallen trees, debris, and excavated material will not adversely affect the streamflow. Exercise care to minimize disturbance of streambanks. Wherever the streambanks are affected by construction, reduce the slope of the streambanks to provide a suitable condition for establishment of vegetative protection.
6. Retard the velocity of runoff water by use of barriers, traps and basins.
7. Trap the sediment contained in runoff water.
8. Take care during the hauling of materials, etc., to keep vehicles from creating a severe erosion problem.
9. Control dust by application of water or other means, as necessary.
10. Stabilize roadways and driveways as soon as feasible.

C. Regrade and stabilize surfaces eroded or otherwise damaged during any and all construction operations.

3.2 STABILIZED CONSTRUCTION ENTRANCE / EXIT

A. Length: As effective, but not less than 100 feet.

B. Thickness: Not less than eight (8) inches. A layer of medium grade filter fabric shall be placed on the subgrade before placement of stone.

C. Width: The full width of all points of ingress and egress, but not less than 20 feet.

D. Radii: Radii shall be appropriate for type of traffic, but not less than 20 feet.

E. Washing: When necessary, vehicles shall be cleaned of sediment prior to exiting the site onto public right-of-way. When washing is required, it shall be done in an area stabilized with crushed stone and draining into an approved sediment trap or basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through use of approved methods.

F. Maintenance: The entrance shall be maintained in a condition, which prevents transport of sediment off of the site or onto public rights-of-way. This may require periodic top dressing

with additional stone and maintenance of measures used to trap sediment. All sediment transported onto public rights-of-way shall be removed immediately.

3.3 SILT FENCING

A. Silt fencing shall be placed on proposed line, parallel to contours, and within an excavated trench of minimum 6 inch depth and width. Excavated soil shall be backfilled against the uphill side of the barrier. The bottom edge of silt fence must be entrenched and backfilled to be effective.

B. Silt fencing shall be purchased in continuous rolls and cut to length of the barrier. When joints are unavoidable, filter material shall be spliced together only at support posts and overlapped a minimum of 6 inches.

C. Install the silt fence in accordance with the manufacturer's recommendations and the details shown on the plans.

3.4 STRAW BALE BARRIERS

A. Bales shall be installed in a trench excavated to the width of the bale, the length of the proposed barrier, and to a minimum depth of 4 inches. Excavated soil shall be backfilled against the uphill side of the barrier.

B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another, such that no gaps are evident. In swales and ditches the barrier shall extend up each side slope such that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.

C. Bales shall be anchored with at least two stakes or rebars through each bale and a minimum of 8 inches into the ground. Provide safety caps if rebar is used to anchor straw bales.

3.5 TEMPORARY VEGETATIVE COVER

A. Soil shall be tested to determined nutrient levels. If soil does not contain sufficient nutrient levels, work 12-12-12 analysis fertilizer 2 to 4 inches deep into soil at a rate of 400-600 pounds per acre.

B. Seed shall be certified by the local State Department of Transportation or Soil Conservation office.

C. To promote temporary vegetation establishment; provide lime, fertilizer (as determined by soil testing) and above-ground irrigation as necessary.

D. Provide mulch consisting of straw or hay, composted materials, wood chips or cellulose fiber, asphalt, or erosion control blanket to cover a minimum of 75% of the area receiving temporary vegetative cover.

E. Temporary vegetation shall be made non-viable, with herbicide or other means, prior to seeding and planting of permanent species.

3.6 EROSION CONTROL BLANKET/MATTING

A. Seed and fertilizer (if required) shall be applied before installation of a blanket or mat.

B. Follow manufacturer's directions for orienting, overlapping, entrenching and securing blankets and mats. Generally orient blanket and mat rolls vertically along a slope, from top to bottom. Horizontal orientation is allowable only for slopes with steepness less than 2:1 and a height of less than twice the roll width.

C. Always entrench the blanket or mat a minimum of 6 inches at any joint, any structure, and at the top and bottom of a slope.

3.7 ROCK CHECK DAMS

A. Provide rock check dams in locations shown on the plans. Maximum spacing shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

B. The center of each check dam should be at least 9 inches lower than its outer edges. Height of the dam shall not exceed 2 feet at its centerline.

3.8 INLET PROTECTION

A. Excavation around the drop inlet (non-paved areas) shall be performed to accommodate the barrier type implemented (e.g. silt fence, straw bales, gravel filled bags). Backfilled material shall be placed on the upstream side of the barrier.

3.9 DUST CONTROL

A. Dust generated during performance of the work shall be controlled by applying water and/or polyacrylamide (PAM). Provide PAM when timely establishment of vegetative cover is not possible.

B. Water and/or shall be provided in the amounts and locations in accordance with general local practice. Do not apply PAM within 25 feet of a natural stream or storm water conveyance.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for selection of products for use in Project.
   2. Product delivery, storage, and handling.
   3. Manufacturer standard warranties on products and special warranties
   4. Comparable products.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through Submittal process to have qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Owner's Action: If necessary, Owner will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Owner will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
    a. Form of Approval: As specified in Section 01 3300.
    b. Use product specified if Owner does not issue a decision on use of comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 3300. Provide information sufficient to show compliance with specified requirements.

1.4 QUALITY ASSURANCE

A. Except as otherwise specifically noted, products shall be new and first (merchantable) quality.

B. Source Limitations: Supply all products of a given type from a single manufacturer unless otherwise acceptable to the Architect.
1. Do not change source or proprietary brands for Products during progress of Work without prior permission of Owner.

C. Where possible, provide standard, domestically produced products likely to be available at later date.

D. Products of a single type shall be of identical manufacture from a single manufacturer. Duplicate items shall be interchangeable. Where appearance or performance characteristics may vary between manufacturing lots, supply all items of type from a single lot.

E. Do not use damaged products in the Work.

F. Use products with limited shelf life within period indicated by manufacturer. Remove from Project site products whose expiration date has passed.

G. Nameplates: Except for required labels and operating data, do not permanently attach or imprint manufacturer or producer nameplates or trademarks on surfaces of products exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide permanent nameplates on each item of service connected or power operated equipment. Indicate manufacturer name, product name, model number, serial number, capacity, speed, ratings, and similar essential operating data. Locate nameplates on accessible surfaces which, in occupied spaces, are not conspicuous.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer recommendations.

B. Delivery and Handling:
   1. Schedule deliveries to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate deliveries with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer recommendations for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.

1.6 EXTRA MATERIALS

A. Supply extra materials from same manufacturing lots as installed products.

B. Store extra materials in original packaging with intact labels. Mark packages with locations of installed products.

C. Store extra materials in building where directed by Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer Warranty: Written warranty supplied by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

C. Submittal Time: Comply with requirements in Section 01 7700.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged, and unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Owner will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Owner's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
7. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Selection Specification: Where Specifications include the phrase "as selected by Owner from manufacturer's full range" or similar phrase, select a product that complies with requirements. Owner will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

D. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation for indicated use and effect.

E. Compatibility: Where more than one choice is available for Contractor's selection of products, select products that are compatible with other choices, including previously selected or installed products.
   1. Total compatibility among Contractor's options is not assured by limitations within Contract Documents, but must be provided by the Contractor.
   2. Compatibility is a basic general requirement of all product selections, and the Owner and Architect will rely on the Contractor's skill, judgment, and integrity for such selections.

F. WARRANTY DISCLAIMER: The Architect and Owner specifically disclaim any warranty as to availability of proprietary products mentioned in the Contract Documents, accuracy of proprietary designations, or safety of manufacture, fabrication, handling, installation, or any other use of specified products.
   1. Contractor shall use all precautions necessary to avoid deleterious exposure to harmful substances, and to prevent contamination or pollution of the Project or the general environment.
   2. Contractor shall notify the Owner in writing as soon as possible regarding objections to use of any product. Include statement of reasons for objections, and recommendations for alternative products or procedures with equivalent quality and function. Transmittal of submittals constitutes waiver of objections to specified products.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Owner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner may return requests without action, except to record noncompliance with these requirements:
   1. Evidence that proposed product does not require revisions to Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Coordination of Owner-installed products.
   6. Progress cleaning.
   7. Starting and adjusting.
   8. Protection of installed construction.

B. Related Requirements:
   1. Section 01 1000: Limitations on use of Project site.
   2. Section 01 3300: Procedures for submitting surveys.
   3. Section 01 7700: Submission of final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 14 days before the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

D. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

E. Certified Surveys: Submit two copies signed by land surveyor.

F. Final Property Survey: Submit drawing files for the survey in AutoCAD version acceptable to Owner and 5 printed full-size copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: Legally qualified to practice in jurisdiction where Project is located and experienced in providing land-surveying services for commercial construction projects of similar size and complexity.

B. Cutting and Patching:
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Conveying systems.
    j. Electrical wiring systems.

k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

B. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

PART 3 - EXECUTION

3.1 EXAMINATION

A. EXISTING CONDITIONS DISCLAIMER: The Owner and Architect specifically disclaim any warranty as to existence and locations of underground and other concealed utilities and construction indicated on Drawings as existing. The Architect prepared Drawings on the basis of information provided by Owner and did not verify the accuracy of that information.

Contractor is therefore advised that actual conditions may differ from those depicted on Drawings or in other Contract Documents.

1. Notify Architect of existing conditions that are outside Contractor's responsibility that would hinder proper or timely execution, or adversely affect performance of finished Work.

B. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Supply location data for work related to Project that must be performed by public utilities serving Project site.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where appropriate, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Inspect products immediately before installation. Do not install defective or damaged products.

3.2 PREPARATION

A. Existing Utility Information: Supply information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Measure in-place construction as needed for fabrication and execution of the Work. No changes to Contract Sum or Contract Time will be allowed for differences between Drawing dimensions and field measurements.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings, including requirements for operation, maintenance access, and other required clearances.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Record Log: Maintain log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain minimum two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

3.5 INSTALLATION

A. Project structures have been designed for strength, stability, and safety in completed form. Until completed, provide temporary bracing and supports needed for strength, stability, and safety of construction in progress and for protection of persons and property.

B. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

C. Comply with manufacturer instructions and recommendations for installing products.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Isolate products from incompatible materials as needed to prevent deterioration.

H. Install products at time and under conditions that will ensure best possible results. Maintain conditions required for product performance until Substantial Completion.

I. Protect permeable pavers from clogging of sediment and debris throughout construction.

J. Tolerances: Where specific tolerances are not stipulated by Contract Documents or manufacturer recommendations, comply with applicable industry standards.

1. Tolerances are noncumulative unless otherwise stated.

3.6 HANDICAPPED ACCESSIBILITY REQUIREMENTS

A. ADA Requirements: In addition to Code requirements governing handicapped accessibility, install Work in conformance with US Department of Justice publication *2010 ADA Standards for Accessible Design*.

1. Where ADA compliance is indicated in Contract Documents, comply with this document.
2. Contractor is cautioned that normal construction industry tolerances may not be acceptable with respect to maximum and minimum dimensions in this document.
3. Refer questions regarding interpretation of ADA requirements to Owner, with copies of correspondence to Architect.
4. Where Code requirements and ADA requirements are at variance, comply with the more restrictive requirements unless otherwise directed by Owner.

B. The Architect's site observations for compliance with handicapped accessibility requirements are limited in scope and frequency per its contract with the Owner. The Owner will therefore rely on the Contractor's skill, judgment, and expertise for compliance with handicapped accessibility requirements and will look solely to the Contractor for such compliance.

3.7 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch to restore surfaces to original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Specific cutting and patching requirements applicable to individual units of Work may be specified in other Specification sections.

D. Requirements of this Section apply to all Work of Contract. Refer to Divisions 21 through 33 for additional requirements and limitations on cutting and patching.

E. Temporary Support: Provide temporary support of work to be cut.

F. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

G. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 1000.

H. Existing Utility Services and Mechanical/Electrical Systems: Where existing services or systems are required to be removed, relocated, or abandoned, bypass such services or systems before cutting to minimize interruption to occupied areas.

I. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

J. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to weathertight condition and ensures thermal and moisture integrity of building enclosure.

K. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, and similar materials from adjacent finished surfaces.

3.8 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.9 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
   a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Clean spills, misapplications, and other accidents immediately as they occur.

D. Do not remove or obscure UL labels, third-party certification labels, or other required labeling.

E. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

F. Installed Work: Keep installed work clean. Clean installed surfaces according to instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

G. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

H. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

I. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 5000.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.10 DAMAGE CORRECTIONS

A. Provide new conforming Work to replace damaged work that cannot be repaired or refinished in place. Damage includes soiling or staining that cannot be satisfactorily cleaned.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

1.2 ACTION SUBMITTALS

A. Contractor's Punch List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified Punch List of Incomplete Items: Final submittal at Final Completion.

1.3 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
   1. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
      a. Submit as-built surveys of all improvements, if not previously submitted.
   2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
   4. Submit test/adjust/balance records.
   5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

B. Procedures Before Substantial Completion: Complete the following minimum 10 working days before requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.

2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used before Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mock-ups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.4 FINAL COMPLETION PROCEDURES

A. Submittals Before Final Completion: Before requesting final inspection for determining final completion, complete the following:
   1. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 working days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
4. Remove tools, construction equipment, machinery, and surplus material from Project site.
5. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
6. Remove debris and surface dust from limited access spaces, including shafts, trenches, equipment vaults, manholes, and similar spaces.
7. Remove labels that are not permanent.
8. Wipe surfaces of mechanical and electrical equipment**,** and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
9. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
10. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
11. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 01 7300 "Execution" for final property survey.
   2. Section 01 7700 "Closeout Procedures" for general closeout procedures.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set of marked-up record prints.
   2. Submit electronic copy of final As-Built Survey and other documentation as required.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.
   1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued. At Contractor’s option, record information may be recorded electronically on PDF files of Contract Drawings.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

B. Format: Submit record Specifications as annotated PDF electronic file and paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

ISSUED	DATE
Bid Package	05-19-17

PART 1 - GENERAL

A. Sections and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 32 1313: Concrete Paving.

1.3 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Design Mixtures: For each concrete mixture.

1.4 INFORMATIONAL SUBMITTALS

A. Test Reports: Submit written laboratory reports within 24 hours of tests.

1.5 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
   1. "General Requirements."
   2. "Formwork and Formwork Accessories."
   3. "Reinforcement and Reinforcement Supports."
   4. "Concrete Mixtures."
   5. "Handling, Placing, and Constructing."

B. Comply with ACI 117.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.3 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type I/II.
   2. Fly Ash: ASTM C 618, Class C or F.
   3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch nominal maximum aggregate size.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

F. Water: ASTM C 94/C 94M.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.5 CONCRETE MIXTURES

A. Comply with ACI 301.

B. Normal-Weight Concrete:
   1. Minimum Compressive Strength: 3000 psi or As indicated at 28 days.
   2. Maximum W/C Ratio: 0.45.
   3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
   4. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
   5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
   1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
   1. For mixer capacity of 1 cu yd or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu yd, increase mixing time by 15 seconds for each additional 1 cu yd.
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions supplied with items to be embedded.

3.3 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3.5 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

B. Do not add water to concrete during delivery, at Project site, or during placement.

C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

D. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches or As Indicated high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 3000 psi or As Indicated at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
6. Before pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions supplied with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.6 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with minimum seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
   1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed-finished as-cast concrete where indicated:
   1. Smooth-rubbed finish.
   2. Grout-cleaned finish.
   3. Cork-floated finish.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
   1. Do not further disturb surfaces before starting finishing operations.

C. Scratch Finish: Apply scratch finish to surfaces indicated and surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes unless otherwise indicated.

D. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

E. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

G. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.8 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq ft x h before and during finishing operations. Apply according to manufacturer recommendations after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.

b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer recommendations. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer recommendations. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301.
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu yd, but less than 25 cu yd, plus one set for each additional 50 cu yd or fraction thereof.

END OF SECTION

ISSUE	**DATE**
Bid Packaage	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements specifically applicable to Division 26, in addition to Division 01 provisions.

1.2 COORDINATION

A. Coordinate the Work specified in this Division under provisions of applicable Sections of Division 01.

B. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain written permission from the Design Professional before proceeding.

C. Electrical drawings are diagrammatic and shall not be scaled for exact locations. If requested, any outlet or device shall be relocated up to six feet in any direction before rough in with no change in price.

D. Coordinate the installation of electrical items including, but not limited to, conduits, outlet boxes, and fixture mounting studs in precast concrete structural elements. All such electrical items shall be installed in precast forms before concrete is poured. Surface mounting of such electrical boxes, devices, or conduit shall not be permitted unless specifically noted on the Drawings.

E. Include all fees and charges associated with providing both permanent electrical service.

1.3 REFERENCES

A. The following references to codes or standards include those adopted by the authorities having jurisdiction over the work, or the latest published version where not adopted by the authorities having jurisdiction. In the event of a conflict between two or more authorities having jurisdiction, contact the Design Professional for a decision.

1. NFPA-70 - National Electrical Code
2. NFPA-780 - Installation of Lightning Protection Systems

B. Obtain all required electrical permits and inspections from Authority Having Jurisdiction. Pay all associated fees.

C. Completed electrical work shall meet requirements of the Occupational Safety and Health Act of 2006, its subsequent amendments, and interpretations of the Act promulgated by Occupational Safety and Health Administration of the Department of Labor.

1.4 GENERAL SCOPE OF ELECTRICAL WORK

A. The scope of electrical work is defined by these Specifications and Drawings.

B. The term, "Design Professional" where used in Division 26 Sections of these Specifications, refers to the Engineer as design professional in responsible charge of the project as defined in Chapter 1 of the International Building Code. As stated in Division-01 specifications, all communications with the Electrical Engineer of Record shall be through the Architect.

C. Provide all electrical systems in complete working order to support and operate all utilization equipment specified under all divisions including those supplied by the Owner.

D. Provide concrete foundations, curbs, housekeeping pads, lighting pole bases, duct banks, etc., required for the installation of electrical equipment as specified under other Sections. Provide 4-inch housekeeping curbs under the footprint of all floor-mounted switchboards, panelboards, motor control centers, transformers, and any other item indicated on the drawings. Extend curb 2-inches beyond equipment footprint on all sides. Provide 1/2-inch chamfer.

E. All equipment shall be installed in accordance with manufacturer's recommendations. Where conflicts occur between Contract Documents and these recommendations, a ruling shall be requested of the Design Professional.

F. Protect work and materials from damage by weather, entrance of water and dirt. Cap conduit during installation in an approved manner. Taping is unacceptable. Avoid damage to materials and equipment in place. Satisfactorily repair or remove and replace damaged work with new materials. Deliver equipment and materials to job site in original, unopened, labeled containers. Store ferrous materials to prevent rusting. Store materials and equipment to prevent staining and discoloring. All material shall be stored in or under a permanent structure.

G. Provide equipment or wiring normally furnished or required for complete electrical systems but not specifically specified on the Drawings or in Specifications, as though specified by both.

H. Execution of contract is evidence that Contractor has examined all Drawings and Specifications related to Work, has visited the site, inspected areas to be renovated, and is informed to extent and character of Work.

I. In event that project is occupied or systems placed in operation in several phases at Owner's request, guarantee and warranty will begin on date each system or item of equipment is accepted by Owner.

1.5 QUALITY ASSURANCE

A. Electrical Installer Qualifications: Minimum 5 years of successful experience on projects with electrical installation work similar to that required for this project.

1.6 WARRANTIES

A. Manufacturer warranties for products supplied under Division 26 shall not be effective to limit the Contractor's general warranty period under the Conditions of the Contract.

1.7 SUBMITTALS – INFORMATIONAL

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Submit inspection and permit certificates.

C. Include certificate of final inspection and acceptance from all authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Products shall be UL listed where such labels are available. Provide additional listings for items where required in the Specifications.

B. Products shall be new, unless specifically indicated on the Drawings as existing to be reused.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Install work using procedures defined in NECA Standard of Installation.

B. Arrange for chases, slots or openings in other building components during progress of construction, to allow for electrical installation.

C. Install access panel or doors where items are concealed behind inaccessible finished surfaces.

D. Provide record documents per requirements of Section 01 7839.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

1.1 SUMMARY

A. This Section includes general requirements for electrical field testing and inspecting. Detailed requirements are specified in each Section containing components that require testing. General requirements include the following:
   1. Qualifications of testing agencies and their personnel.
   2. Suitability of test equipment.
   3. Calibration of test instruments.
   4. Coordination requirements for testing and inspecting.
   5. Reporting requirements for testing and inspecting.

1.2 QUALITY ASSURANCE

A. Testing Agency Qualifications: As specified in each Section containing electrical testing requirements and in subparagraph and associated subparagraph below.

B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.

C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL TESTS AND INSPECTIONS

A. If a group of tests are specified to be performed by an independent testing agency, prepare systems, equipment, and components for tests and inspections, and perform preliminary tests to ensure that systems, equipment, and components are ready for independent agency testing. Include the following minimum preparations as appropriate:
   1. Perform insulation-resistance tests.
   2. Perform continuity tests.
   3. Perform rotation test (for motors to be tested).
   4. Provide stable source of single-phase, 208/120-V electrical power for test instrumentation at each test location.

B. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:
   1. Manufacturer's written testing and inspecting instructions.

2. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
3. Tabulation of expected measurement results made before measurements.
4. Tabulation of "as-found" and "as-left" measurement and observation results.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Poles and accessories for support of luminaires.

1.2 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete lighting fixture.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.3 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Product Data: For each pole, accessory, and luminaire-supporting device, arranged as indicated.
   1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
   2. Include finishes for lighting poles and luminaire-supporting devices.
   3. Anchor bolts.
   4. Manufactured pole foundations.

C. Shop Drawings:
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, and required clearances, method of field assembly, components, and location and size of each field connection.
   3. Detail fabrication and assembly of poles and pole accessories
   4. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
   5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
   6. Method and procedure of pole installation. Include manufacturer's written installations.

D. Samples: For each exposed lighting pole, standard, and luminaire-supporting device and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

B. Material Test Reports:
   1. For each foundation component, by a qualified testing agency.
   2. For each pole, by a qualified testing agency.

C. Source quality-control reports.

D. Field quality-control reports.

E. Soil test reports

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For poles.to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include pole inspection and repair procedures.

B. Manufacturer warranties.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Pole repair materials.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for foundation testing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of poles that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 STEEL POLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Lighting.

B. Source Limitations: For poles, obtain each color, grade, finish, type, and variety of pole from single source with resources to provide products of consistent quality in appearance and physical properties.

C. Poles: Comply with ASTM A 500/A 500M, Grade B carbon steel with minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: Round, tapered.
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

D. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless steel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.

E. Pole-Top Tenon’s: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

F. Fasteners: Stainless steel size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

H. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

I. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder Coat: Comply with AAMA 2604.
   a. Electrostatic-applied powder coating; single application and cured to minimum 2.5- to 3.5-mils dry film thickness. Coat interior and exterior of pole for equal corrosion protection.
   b. Color: Match finish of luminaire.

2.3 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.
1. -Lower Control: Remote-control station with 15 feet of cable.

2.4 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F 1554 Grade 55, with minimum yield strength of 55,000 psi.
1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C
2. Threading: Uniform National Coarse Class 2A.

B. Nuts: ASTM A 563, Grade A, Heavy-Hex
1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C
2. Two nuts provided per anchor bolt, shipped with nuts pre-assembled to the anchor bolts.

C. Washers: ASTM F 436, Type 1.
1. Galvanizing: Hot dip galvanized according to ASTM A 153, Class C
2. One washers provided per anchor bolt.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine poles, luminaire-mounting devices, lowering devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

B. Examine roughing-in for foundation and conduit to verify actual locations of installation.

3.2 POLE FOUNDATION

A. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123 M; and with top-plate and mounting bolts to match pole-base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.3 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on pole

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.
   1. Fire Hydrants and Water Piping: 60 inches
   2. Water, Gas, Electric, Communications, and Sewer Lines: 10 feet
   3. Trees: 15 feet from tree trunk.
   4. Coordinate remaining paragraphs below with Drawings. See the Evaluations for structural and soil-engineering coordination.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.
   1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
   2. Install base covers unless otherwise indicated.
   3. Use a short piece of 1/2 -inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Fill unpaved ring with pea gravel. Insert material to a level 1 inch below top of concrete slab.

F. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.5 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding electrode for each pole unless otherwise indicated.
   2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
   1. Inspect poles for nicks, mars, dents, scratches, and other damage.

2. System function tests.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Protecting existing vegetation to remain.
   2. Removing existing vegetation.
   3. Stripping and stockpiling topsoil.
   4. Removing above- and below-grade site improvements.
   5. Disconnecting, capping or sealing site utilities.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

D. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

E. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.3 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials become Contractor's property and shall be removed from the site.

1.4 INFORMATIONAL SUBMITTALS

A. Schedule of Demolition Activities:
   1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services.
   3. Coordination for shutoff, capping, and continuation of utility services.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Notify utility locator service for area where Project is located at least 48 hours (or per local requirements) before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 2000 "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.3 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than seven days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

C. Removal of underground utilities is included in earthwork sections and with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
   2. Use only hand methods for grubbing within protection zones.

B. Fill depressions caused by demolition with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

C. Burning: Do not burn demolished materials.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating and filling for rough grading the Site.
   2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
   3. Excavating and backfilling for structures.
   4. Subbase course for concrete walks and pavements.
   5. Subbase course for asphalt paving.
   6. Subsurface drainage backfill for walls, trenches, and unit paving.
   7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:
   1. Section 31 1000: Site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
   2. Section 31 2319: Lowering and disposing of ground water during construction.
   3. Section 31 5000: Shoring, bracing, and sheet piling of excavations.
   4. Section 32 9200: Finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
   5. Section 32 9300: Finish grading in planting areas and tree and shrub pit excavation and planting.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the pavement and slab-on-grade that infiltrates stormwater and minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Warning tapes.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site soil and borrow material proposed for fill and backfill as follows:
1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

B. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Owner.

C. Utility Locator Service: Notify Georgia 811 for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

E. Do not commence earth-moving operations until plant-protection measures specified in Section 01 5000 "Temporary Facilities and Controls" are in place.

F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Erection of sheds or structures.
   4. Impoundment of water.
   5. Excavation or other digging unless otherwise indicated.
   6. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Soils that are not Satisfactory Soils.
2. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
3. Soils determined by the Engineer to be Unsatisfactory.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   3. Permittivity: 0.2 per second, minimum; ASTM D 4491.
   4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:
   1. Portland Cement: ASTM C 150/C 150M, Type I, Type II, or Type III.
   2. Fly Ash: ASTM C 618, Class C or F.
   3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/4-inch nominal maximum aggregate size.
   4. Water: ASTM C 94/C 94M.
   5. Air-Entraining Admixture: ASTM C 260/C 260M.

B. Produce conventional-weight, controlled low-strength material with 140-psi compressive strength when tested according to ASTM C 495/C 495M.

2.4 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
   1. Red: Electric.

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches outside of concrete forms other than at footings.

b. 12 inches outside of concrete forms at footings.
c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs-on-grade.
f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
   1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage and waterproofing,
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring, bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in minimum 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:
   1. Soil Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
      a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:
   1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
   2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
   3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Pavements: Plus or minus 1/2 inch.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in minimum 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 698 with minimum two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 95 percent of maximum dry unit weight according to ASTM D 698 with minimum two passes of a plate-type vibratory compactor.

3.18 \SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
   1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place base course material over subbase course under hot-mix asphalt pavement.
   3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
   4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
   1. Paved and Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
   2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
   3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes construction of dewatering systems.

1.2 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
   1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
   2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until structures such as drains and sewers have been constructed and fill materials have been placed, or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes temporary excavation support and protection systems.

1.2 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of: supporting excavation sidewalls, resisting soil and hydrostatic pressure, and supporting superimposed and construction loads.

1. Provide professional engineering services to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.

1.3 PROJECT CONDITIONS

A. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Owner if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
2. Provide photographic evidence with date stamp of all existing adjacent structures before and after performing Work.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

C. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

D. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Hot-mix asphalt paving.
   2. Pavement-marking paint.
   3. Hot-mix asphalt patching.
   4. Hot-mix asphalt paving overlay.
   5. Cold milling of existing hot-mix asphalt pavement.

B. Related Sections include the following:
   1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
   2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.2 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. GDOT: Georgia Department of Transportation.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
   1. GDOT Standard Specification: Georgia Department of Transportation Standard Specifications for Construction of Transportation Systems.
   2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.
   1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

B. Regulatory Requirements: Comply with GDOT and City of Roswell Department of Transportation for asphalt paving work.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in authorities having jurisdiction. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
   1. Review condition of subgrade and preparatory work.
   2. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
   1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
   2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
   3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations and complying with requirements of GDOT Standard Specification.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO MP 1, PG 64-22.

B. Asphalt Cement: Material complying with requirements of GDOT Standard Specification.

C. Prime Coat: Asphalt emulsion prime complying with GDOT Standard Specification.

D. Tack Coat: ASTM D 977, emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application, complying with requirements of GDOT Standard Specification.

E. Fog Seal: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

F. Water: Potable.

G. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

A. Sand: ASTM D 1073, Grade Nos. 2 or 3.

B. Joint Sealant: ASTM D 3405, hot-applied, single-component, polymer-modified bituminous sealant.

C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.
   1. Color: White, Yellow, As indicated.

D. Glass Beads: AASHTO M 247, Type 1.

E. Thermoplastic Markings: All traffic symbols and markings to be placed within the public Right-of-Way shall be thermoplastic.
   1. Preformed plastic pavement markings shall comply with requirements of GDOT Standard Specification.
   2. Thermoplastic pavement markings shall comply with requirements of GDOT Standard Specification.

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
   2. Bituminous Base Course: GDOT Standard Specification.
   3. Asphaltic Surface Course: GDOT Standard Specification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase to locate areas that are unstable or that require further compaction.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
   1. Mill to a depth of 1-1/2 inches.
   2. Mill to a uniform finished surface free of gouges, grooves, and ridges.
   3. Control rate of milling to prevent tearing of existing asphalt course.
   4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
   5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
   6. Transport milled hot-mix asphalt to asphalt recycling facility.
   7. Keep milled pavement surface free of loose material and dust.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
   1. Clean cracks and joints in existing hot-mix asphalt pavement.
   2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
   3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared aggregate base course, bituminous base course, or previous asphaltic course is ready to receive paving.
   1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.6 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Spread mix at minimum temperature of 250 deg F.
   3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
   4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Bituminous Base Course: Plus or minus 1/2 inch.
2. Asphaltic Surface Course: Plus 1/4 inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Bituminous Base Course: 1/4 inch.
2. Asphaltic Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.10 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age per paint manufacturer's written instructions before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal.(0.72 kg/L).

E. Place all traffic symbols and markings within the public Right-of-Way per requirements of GDOT Standard Specification.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses shall be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
   a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
   b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow excavated materials to accumulate on-site.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Driveways and roadways.
   2. Parking lots.
   3. Curbs and gutters.
   4. Walkways.

B. Related Sections include the following:
   1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
   2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
   3. Division 03 Section "Miscellaneous Cast-in-Place Concrete" for general applications of concrete.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.3 SUBMITTALS

A. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

B. Construction Joint Layout: Indicate proposed construction joints required to construct the pavement.
   1. Plan showing construction and contraction joints.
   2. Location of construction joints is subject to approval of the Owner.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for facility operations and construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

C. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.

D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

E. Plain Steel Wire: ASTM A 82, as drawn.

F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

G. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports

according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I or II.
   1. Fly Ash: ASTM C 618, Class F or C.
   2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
   1. Maximum Aggregate Size: 1-1/2 inches nominal.
   2. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Water: ASTM C 94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Products: Subject to compliance with requirements, provide one of the following:
   1. White Waterborne Membrane-Forming Curing Compound:
      a. AH Curing Compound #2 WB WP; Anti-Hydro International, Inc.
      b. Aqua Resin Cure; Burke Group, LLC (The).
      c. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
      d. Thinfilm 450; Kaufman Products, Inc.

e. Aqua Kure-White; Lambert Corporation.
f. L&M Cure R-2; L&M Construction Chemicals, Inc.
g. 1200-White; W. R. Meadows, Inc.
h. White Pigmented Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
i. Resi-Chem High Cure; Symons Corporation.
j. Horncure 200-W; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
k. Hydro White 309; Unitex.

2. Clear Waterborne Membrane-Forming Curing Compound:
   a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
   b. Aqua Resin Cure; Burke Group, LLC (The).
   c. Safe-Cure Clear; ChemMasters.
   d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
   e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
   f. Aqua Kure-Clear; Lambert Corporation.
   g. L&M Cure R; L&M Construction Chemicals, Inc.
   h. 1100 Clear; W. R. Meadows, Inc.
   i. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
   j. Resi-Chem Clear Cure; Symons Corporation.
   k. Horncure WB 30; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
   l. Hydro Cure 309; Unitex.
   m. Certi-Vex Enviocure 100; Vexcon Chemicals, Inc.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork, or ASTM D 1752-84, recycled rubber.

B. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.

C. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.
   1. Color: Blue for handicapped requirements, yellow for fire lanes, white overtop of 2-inch wider black elsewhere.

D. Thermoplastic Traffic Markings: Provide in accordance with the local Department of Transportation Specifications. Symbols and crosswalks to be extruded; striping to be sprayed.

E. Glass Beads: AASHTO M 247.

F. Wheel Stops:

1. Precast, air-entrained concrete; 3000-psi minimum compressive strength; approximately 5 inches high, 8 inches wide, and 72 inches long. Provide chamfered corners and provide holes for dowel-anchoring to substrate.
2. Dowels: Steel, diameter of 3/4 inch.

G. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

H. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

I. Detectable Warning Surface: Raised truncated domes with a nominal diameter of 0.9 inch, a nominal height of 0.2 inch, a center-to-center spacing of 1.7 inches and with a visually-contrasting color (light-on-dark or dark-on-light or color selected by Architect). The material used to provide contrast shall be an integral part of the walking surface.
1. Acceptable Products:
   a. Whitacre-Greer or Pavestone (or equal) solid brick or concrete paving units.
   b. Armor-Tile vitrified polymer composite cast-in-place tiles.

2.7 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Proportion mixes to provide concrete with the following properties:
1. Minimum Compressive Strength (28 Days): 4000 psi
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches.
   a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
4. Air Content: 4-1/2 percent plus or minus 1.5 percent.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

D. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
   1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances, including accessibility slopes and cross-slopes.
   1. Verify location of all accessible routes.

B. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.5 JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated. Locate expansion joints at maximum 30 feet o.c. for sidewalks. Locate expansion joints at all curb returns.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as follows: In vehicular pavements, place contraction joints to form squares and to not exceed 12 feet on any side. In sidewalks, place contraction joints to form squares and to not exceed 6 feet on any side. In curbs, place contraction joints at 10 feet on center. See drawings for additional information.

F. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
   a. Radius: 1/4 inch.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

G. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 301 for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 301.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

J. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

M. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 SPECIAL FINISHES

A. Detectable Warning Surface: A 36-inch wide detectable warning surface shall be installed the full width of all sidewalk ramps, and a continuous 36 -inch wide band along all sidewalks which are flush with vehicle areas.
   1. Unless noted otherwise, provide truncated dome detectable warning surfaces.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

C. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped

at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
   4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
   5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
   6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
   7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
   8. Joint Spacing: 3 inches.
   9. Contraction Joint Depth: Plus 1/4 inch, no minus.
   10. Joint Width: Plus 1/8 inch, no minus.
   11. Accessible Routes, Ramps and Parking Areas: Slopes, including cross slopes, shall not exceed maximums noted on the Drawings.

3.11 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal..

3.12 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement. Extend upper portion of dowel 5 inches into wheel stop and lower portion a minimum of 5 inches into pavement.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd.. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.

C. Test results shall be reported in writing to Owner, Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.14 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cold-applied joint sealants.
   2. Hot-applied joint sealants.
   3. Joint-sealant backer materials.

1.2 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Product Data: Each type of sealant.

1.3 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.
   1. Crafco Inc.; RoadSaver Silicone.
   2. Dow Corning Corporation; 888.
   3. Pecora Corporation; 301 NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
   1. Crafco Inc.; RoadSaver Silicone SL.
   2. Dow Corning Corporation; 890-SL.

3. Pecora Corporation; 300 SL.

2.3 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I, II, or III.
   1. Crafco Inc.; RoadSaver 222.
   2. Meadows, W.R., Inc.; Sealtight 3405.
   3. Right Pointe; JTS 3405 Regular 003, JTS 3405 Rubber 009.

2.4 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

B. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
   1. Place joint sealants so they fully contact joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

C. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

D. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Brick pavers set in aggregate setting bed.

B. Related Sections include the following:
   1. Division 31 Section "Earth Moving" for compacted subgrade and subbase course, if any, under unit pavers.
   2. Division 32 Section "Concrete Paving" for concrete base course under unit pavers.

1.2 SUBMITTALS

A. Product Data: For the following:
   1. Brick pavers.

B. Samples for Verification: Full-size units of each type of unit paver indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect unit pavers and aggregate during storage and construction against soiling or contamination from earth and other materials.
   1. Cover pavers with plastic or use other packaging materials that will prevent rust marks from steel strapping.

1.5 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Concrete Pavers:
      a. Hallmark by Paverlock.
      b. Holland Stone by Paver Design Inc.
      c. Or equal.

2.2 COLORS AND TEXTURES

A. Colors and Textures: Red and black blend. Solid red borders.

2.3 UNIT PAVERS

A. Concrete Pavers: Solid, interlocking paving units, ASTM C 936, made from normal-weight aggregates in sizes and shapes indicated.

2.4 AGGREGATE SETTING-BED MATERIALS

A. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements of ASTM C 33 for fine aggregate.

B. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.

2.5 CONCRETE BASE SETTING BED MATERIALS

A. See Section 32 1313 Concrete Paving.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.

B. Remove substances, from concrete substrates, that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Joint Pattern: Herringbone to match existing unit paver joint pattern.

E. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.

F. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

3.4 SAND SETTING-BED PAVER APPLICATIONS

A. Place leveling course and screed to a thickness of 1-inch, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

B. Treat leveling base with soil sterilizer to inhibit growth of grass and weeds.

C. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.

1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

D. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:

1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches of the laying face. Cover open layers with nonstaining plastic sheets overlapped 48 inches on each side of the laying face to protect it from rain.

E. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

F. Do not allow traffic on installed pavers until sand has been vibrated into joints.

G. Repeat joint-filling process 30 days later.

3.5 REPAIR, POINTING, CLEANING, AND PROTECTION

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

END OF SECTION

ISSUED	DATE
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work consists of furnishing and construction of a Permeable Interlocking Concrete Pavement System in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the plans.

B. Installation work includes:
   1. Verifying subgrade is to the correct lines, grades, infiltration rate, and density.
   2. Furnishing and installing geotextile and/or membrane liner (where required), underdrain piping (where required), sub-base course, base course, bedding course, edge restraints, concrete pavers and permeable joint material to the lines and grades shown on the construction drawings.

1.2 RELATED SECTIONS

A. Section 312319 Dewatering

B. Section 312000 Earth Moving

C. Section 321313 Concrete Paving

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. GDPS-4-M Guide for Design of Pavement Structures

B. American Society of Civil Engineers (ASCE)
   1. ASCE 58-10 Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways

C. American Society for Testing and Materials (ASTM)
   1. ASTM C-29 Bulk Density ("Unit Weight") and Voids in Aggregate
   2. ASTM C-94 Standard Specification for Ready Mixed Concrete
   3. ASTM C-131 Resistance to Degradation of Small-Sized Course Aggregate by Abrasion and Impact in the Los Angeles Machine
   4. ASTM C-136 Sieve Analysis of Fine and Course Grained Aggregates
   5. ASTM C-140 Sampling and Testing Concrete Masonry Units and Related Units
   6. ASTM C-936 Solid Concrete Interlocking Paving Units
   7. ASTM C-979 Pigments for Integrally Colored Concrete
   8. ASTM C-1645 Freeze-thaw and De-icing Salt Durability of Solid Interlocking Paving Units
   9. ASTM D-448 Standard Classification for Sizes of Aggregates for Road and Bridge Construction
   10. ASTM D-698 Laboratory Compaction Characteristics of Soil Using Standard Effort
   11. ASTM D-1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
   12. ASTM D-1883 CBR (California Bearing Ratio) of Laboratory Compacted Soils
   13. ASTM D-2488 Description and Identification of Soils (Visual-Manual Procedure)

14. ASTM D-3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
15. ASTM D-3350 Polyethylene Plastic Pipe and Fittings Materials
16. ASTM D-4873 Identification, Storage and Handling of Geosynthetic Rolls and Samples
17. ASTM D-6928 Resistance of Course Aggregates to Degradation by Abrasion in the Micro-Deval Apparatus

D. Interlocking Concrete Pavement Institute (ICPI)
1. Permeable Interlocking Concrete Pavement manual (latest edition)
2. Permeable Design Pro software for hydrologic and structural design
3. Tech Spec Technical Bulletins.

1.4 SUBMITTALS

A. Contractor shall submit to the owner for approval, and retain for the balance of the project, a minimum of four full size samples of each Concrete Paver type/size/thickness/color/finish specified; the samples shall represent the range of shape, texture and color permitted for the respective type. Color(s) will be selected by Engineer/Owner from Manufacturer's standard colors.

B. Prior to delivery of the associated material to the site, the Contractor shall submit the following product specific documentation for approval:
1. Aggregates:
   a. Sieve analysis per ASTM C-136
   b. Durability of aggregates using Micro Deval Degradation using ASTM D-6928.
   c. Percentage of angular and sub-angular particles per ASTM D-2488.
   d. Minimum 3 lb sample of each material for independent testing.
   e. Source test results for void ratio and bulk density of the Base and Sub-base aggregates per ASTM C-29.
2. Concrete Pavers:
   a. Test results from an independent testing laboratory for compliance to ASTM C-936 or other applicable requirements for each 100,000 full sized pavers delivered to the site or at any time a change in the manufacturing process, mix design, cement, aggregate or other material. If pavers pass all requirements for a sequence of 400,000, pavers then the testing frequency may be reduced to one set of tests per 200,000 full size pavers upon approval by the Owner.
   b. Stitching details for mechanical installation to be used during product placement as supplied by manufacturer.
   c. Warranty documentation
   d. Close out Operations and Maintenance program
   e. Material Safety Data Sheets
3. Geosynthetics
   a. One 18 inch x 18 inch panel of each geosynthetic (Geotextile or Membrane Liner) for inspection and testing. The sample panels shall be uniformly rolled and shall be wrapped in plastic to protect the material from moisture and damage during shipment. Samples shall be externally tagged for easy identification. External identification shall include: name of manufacturer; product type; product grade; lot number; and physical dimensions.
   b. Material Safety Data Sheets

4. Written Method Statement and Quality Control Plan that describes material staging and flow, paving direction and installation procedures, including representative reporting forms that ensure conformance to the project specifications.

1.5 QUALITY ASSURANCE

A. Contractor shall submit a minimum of five (5) mechanically constructed projects being at least 2,500 square feet in size prior to bid date to be qualified. A minimum of one (1) of these projects shall be a successful retrofit of an existing roadway. Contact names and telephone numbers shall be listed for each project with the date of completion.

B. At a minimum, the Contractor's Site Foreman shall hold PICP Technician Certificate from the Interlocking Concrete Pavement Institute (ICPI) contractor certification program. The Site Foreman is expected to be onsite for the entire installation.

C. Contractor shall conform to all local, state/provincial licensing and bonding requirements.

D. Contractor will hold a mandatory pre-construction meeting with Engineer, Owner, and affected sub-trades accessing PICP work area to review method statement and quality control plan and communicate to all parties a work flow that is most desirable to meet the construction schedule as set forth by the General Contractor.

1.6 MOCK-UPS

A. Install a 10 ft x 10 ft paver area following the installation practices described in Article 3.02 to 3.04.

B. This area will be used to verify: surcharge of the Bedding Course; joint sizes; lines; laying pattern(s); stitching details (for mechanical installation); color(s); and, texture of the job.

C. To provide a proper representation of color blend, a minimum of 3 cubes for manual installation, and 6 cubes for mechanical installation, will be pulled from.

D. This area shall be the standard from which the work will be judged.

E. Subject to approval by the Owner, the mock-up may be retained as part of the finished work. If mock-up is not retained, remove and dispose of mock-up at the completion of the project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.

C. Contractor shall check all materials upon delivery to assure that the proper materials have been received and are in good condition before signing off on the manufacturer's packing slip.

D. Contractor shall protect all materials from damage or contamination due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged or contaminated materials shall not be incorporated into the work.

E. Deliver Concrete Pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload and store Concrete Pavers at job site in such a manner that no damage occurs to the product.

F. Handle and transport aggregates to avoid segregation, contamination and degradation. Keep different materials sufficiently separated as to prevent mixing. Do not dump or store one material on top of another unless it is part of the installation process. Cover material with waterproof covering to prevent exposure to rainfall or removal by wind – secure the covering in place.

G. Geosynthetics shall be delivered, stored and handled in accordance with ASTM D-4873.

1.8 ENVIRONMENTAL CONDITIONS

A. Do not install during heavy rain, freezing conditions or snowfall.

B. Do not install on frozen soil subgrade.

C. Do not install frozen aggregates.

1.9 MAINTENANCE MATERIAL

A. As required, provide 2 additional pallets (minimum) of each paver material and color sufficient for use by the Owner for maintenance and repair as attic stock.

B. Pavers must be from the same production run as the installed materials.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Belgard, or approved equal.
Georgia Masonry Supply
1443 Battle Creek Road
Jonesboro, GA 300236
(800) 621-5222

2.2 DEFINITIONS

A. Base Course – within the context of this specification, a washed open graded free draining aggregate material (No. 57 Stone) of a designed thickness that provides both structural support over the Sub-base and water storage capacity (within the voids). It also serves as a choking material between the Bedding Course and Sub-base.

B. Bedding Course – within the context of this specification, a two-inch thick layer of washed open graded free draining aggregate material (No. 89 Stone) loosely screeded smooth for bedding of the Concrete Pavers.

C. Concrete Pavers – within the context of this specification, solid individual paving units manufacturing from concrete that are either specifically designed for use in permeable applications (include joints and voids) or are laid in a pattern that creates large enough openings to provide infiltration. Concrete Pavers are shipped in clusters called bundles or cubes, which consist of several layers of pavers strapped or wrapped together.
   1. Voids – larger openings between the individual pavers that provide for infiltration.
   2. Joints – smaller openings between the individual pavers that provide vertical and horizontal interlock between units.

D. Edge Restraint – within this specification, a cast in place concrete curb, building or other stationary object that prevents the lateral movement of the Bedding Course and Concrete Pavers so they do not spread and loose interlock. Other Edge Restraints options include cut stone, precast concrete and/or submerged concrete edge complete with mortared pavers.

E. Flow Barriers – check dams, soil berms (non-excavated soil subgrade), concrete curbs, or aggregate wrapped in an impermeable geomembrane used to slow down flow.

F. Geotextile – Woven or non-woven fabrics made from plastic fibers used primarily for separation between Sub-base and Subgrade.

G. Underdrain Piping – pipe or series of horizontal pipes within the sub-base that discharge to a catch basin, ditch or other receiving body beyond the extent of the paved area. Piping is typically elevated in a Partial Exfiltration System, and at the bottom of the Sub-base in a No Exfiltration System.

H. Laying Face – the working edge of the pavement where the laying of pavers is occurring.

I. Mechanical Installation - The use of specialized machines to lift whole layers of pavers from the bundles and place them on the prepared bedding course. These specialized machines are designed specifically for this application.

J. Membrane Liner – impermeable liner placed at the bottom and sides of a No Exfiltration System, used to prevent the exfiltration/discharge of water other than through the Horizontal Drainage Piping. Usually includes a geotextile on top (possibly bottom) for protection.

K. Permeable Joint Material – a washed open graded free draining aggregate material (No. 89 Stone) used to fill the spaces (joints and voids) between Concrete Pavers to create interlock and still maintain infiltration.

L. Permeable Interlocking Concrete Pavement System – a system of paving consisting of Concrete Pavers placed in an interlocking pattern with the joints and voids filled with Permeable Joint Material. The minimum rate of infiltration of the Concrete Pavers and Permeable Jointing Material is 10 inches per hour, or the design storm, whichever is greater. The Bedding Course, Base Course and Sub-base Courses provide structural support over the Subgrade and stores, exfiltrates (into the Subgrade) and/or drains the infiltrating water.

M. Sub-base Course – within the context of this specification, an open graded free draining aggregate material (GDOT No. 34 Stone) of a designed thickness that provides both structural support over the Subgrade and water storage capacity (within the voids).

N. Subgrade – the soil upon which the pavement structure and shoulders are constructed.

2.3 CONCRETE PAVERS:

A. Concrete Paver products required include:
PRODUCT: Aqua-Bric Series or approved equal

Product Size: 5" x 10"

Product Thickness: 80 mm
Pattern: 90 degree Herringbone (stitched)
Product Color: Ardennes Grey
Product Finish: Standard

B. Concrete Pavers shall conform to the following requirements set forth in ASTM C-936:
1. Measured length or width of test specimens shall not differ by more than +/- 0.063 in, while measured thickness shall not differ by more than +/- 0.125 in.
2. Average compressive strength of 8,000 psi (55 MPa) with no individual unit under 7,200 psi (50 MPa) when tested in accordance with ASTM C-140.
3. Average absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C-140.
4. Where freeze-thaw testing is required, the average mass loss of all specimens tested shall not be greater than (A) 225 g/m2 when subject to 28 freeze thaw cycles, or (b) 500 g/m2 when subject to 49 freeze thaw cycles. Testing shall be conducted using a 3% saline solution in according to ASTM C-1645.
5. Paver shall allow a minimum infiltration rate of 200 inches per hour.
6. Paver shall be installed by a Belgard Authorized Installer.
7. ADA Compliance: Paver joints shall not exceed 13mm or ½".

C. Efflorescence shall not be cause for rejection.

D. Pigment in Concrete Pavers shall conform to ASTM C-979.

2.4 BEDDING COURSE MATERIAL:

A. 2-Inches of No. 8 stone that is a clean, non-plastic aggregate, free from deleterious or foreign matter, manufactured from crushed rock.

B. Micro Deval Degradation of less than 8% as per ASTM D-6938.

C. Percent of angular and sub-angular particles greater than 90%. Do not use rounded river gravel.

D. LA Abrasion <40 as per ASTM C-131, minimum CBR of 80% as per ASTM D-1883.

E. Gradation to conform to Table 1 as tested in accordance to ASTM C-136. All aggregates shall have equal to or less than 2% passing the No. 200 (0.075 mm) sieve.

Table 1
Bedding Course Gradation Requirements (ASTM No. 8 Stone per ASTM D-448)

Sieve Size	Percent Passing
1/2 in. (12.5 mm)	100
3/8 in.(9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 40
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

2.5 PERMEABLE JOINT MATERIAL:

A. Where joints are greater than or equal to ¼ inch, use ASTM No. 8 Stone as specified for the Bedding Course.

B. Where joints are less than ¼ inch, use pre-bagged Permeable Joint Material as supplied by manufacturer.

2.6 BASE AND SUB-BASE MATERIAL:

A. Open Graded Base course shall be a layer of 6-Inches of No. 57 stone.

B. Open Graded Sub-base course shall be a layer of 28-Inches of GDOT No. 34 stone.

C. Base and sub-base shall be clean, non-plastic aggregate, free from deleterious or foreign matter, manufactured from crushed rock.

D. Micro Deval Degradation of less than 8% as per ASTM D-6938.

E. Percent of angular and sub-angular particles greater than 90%. Do not use rounded river gravel.

F. LA Abrasion <40 as per ASTM C-131, minimum CBR of 80% as per ASTM D-1883.

G. Gradation of Base Course shall conform to Table 2 as tested in accordance to ASTM C-136. Gradation of Sub-base Course to conform to Table 3 as tested in accordance to ASTM C-136. All aggregates shall have equal to or less than 2% passing the No. 200 (0.075 mm) sieve.

Table 2
Grading Requirements for Base Course (ASTM No. 57 Stone per ASTM D-448)

Sieve Size	Percent Passing
1-½ in. (37.5 mm)	100
1 in. (25 mm)	95 to 100
1/2 in. (12.5 mm)	25 to 60
No. 4.(9.5 mm)	0 to 10

No. 8 (2.36 mm)	0 to 5

Table 3
Grading Requirements for Sub-base Course (ASTM No. 3 Stone per ASTM D-448)

Sieve Size	**Percent Passing**
3 in. (75 mm)	100
2- ½ in. (63 mm)	90 to 100
2 in. (50 mm)	35 to 70
1-½ in. (37.5 mm)	0 to 15
¾ in. (19 mm)	0 to 5

2.7 EDGE RESTRAINTS:

A. Edge restraints shall be cast in place concrete curbs constructed to the dimensions of the municipal standards.

2.8 GEOSYNTHESTICS:

A. Where required, Geotextiles and/or Membrane Liner materials shall be selected by the Engineer and/or Owner based upon the intended use.

B. Install impermeable membrane liners around utility services in areas shown on the drawings. The areas outlined on the drawings reflect residences that may be located at a lower elevation than the roadway. The intent is to prevent storm water from migrating down existing service trenches and causing damage to a residence.

C. Where required, place geotextiles on the prepared subgrade as separation material.

D. Overlap per manufacturer specifications and/or Geotechnical Engineers recommendation.

E. Geotextile for Sides of Paver System. Geotextile shall be a needled, non-woven, polypropylene geotextile with Grab Tensile Strength equal to or greater than 120 lbs. (ASTM D4632), with a Mullen Burst Strength equal to or greater than 225 lbs./sq. in. (ASTM D3786), with a Flow Rate greater than 125 gpm/sq. ft. (ASTM D4491), and an Apparent Opening Size (AOS) equivalent to a US # 70 or # 80 sieve (ASTM D4751). The geotextile AOS selection is based on the percent passing the No. 200 sieve in "A" Soil subgrade, using FHWA or AASHTO selection criteria.

F. Geomembrane for Flow Barrier. Geomembrane shall be a heavyweight HDPE fabric. Fabric shall be resistant to ultraviolet and biological deterioration, and rotting within a pH range of 2 to 13 s.u. Fabric shall be Aquamaster NovaLiner 20 or approved equal and shall have the following minimum properties:

PROPERTY	TEST METHOD	MINIMUM VALUE
THICKNESS	ASTM D1777	20 MIL
GRAB TENSILE	ASTM D7004	250 LB
MULLEN BURST	ASTM D751	550 PSI
WEIGHT		9.4 OZ / SQUARE YARD
TONGUE TEAR	ASTM D5884	65 LBS.
PUNCTURE RESISTANCE	ASTM D4833	154 LBS.
HYDRSTATIC RESISTANCE	ASTM D751	139 PSI
PERMEABILITY	(MVTR)	1.0 (10^{-12}) CM/SEC
UV WEATHERING @ 2000 HOURS	ASTM G151	>90% STRENGTH RETENTION

2.9 UNDERDRAIN PIPING:

A. Underdrain piping shall be ADS Smoothwall Sewer and Drain pipe suitable for gravity flow drainage meeting the requirements of ASTM F810. Pipe shall have a smooth interior and the pipe joints shall be bell and spigot with the bell ends integrally formed to provide a soil tight connection.

B. Pipe material shall be high-density polyethylene conforming to the minimum requirements of cell classifications 424410C or E as defined in the latest version of ASTM D3350.

C. Installation shall be in accordance with ASTM D2321. The minimum cover required in traffic areas shall be no less than 2 feet unless approved otherwise by the Owner.

D. Pipe shall contain 3 perforations (.625 Inches in diameter each) spaced approximately 120 degrees apart around the circumference of the pipe. At a minimum, each linear foot of pipe shall have these circumferential perforations spaced every 0.5 linear feet.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify elevations and surface tolerances of subgrade correspond with the final surface elevations of the pavers. Do not correct excavation deficiencies of subgrade with additional bedding materials.

B. Contractor is responsible for checking and accepting surface elevations of soil subgrade and providing written certification to paver installer prior to beginning work.

C. Recommendations for compaction of soil subgrade (where necessary) will be determined by a geotechnical engineer. Do not proceed with installation until subgrade conditions have been approved by the geotechnical engineer.

D. Subgrade shall not be compacted wherever feasible to promote infiltration. Follow geotechnical engineer's recommendations regarding subgrade preparation.

E. Verify soil subgrade is free from standing water and in satisfactory condition.

F. Minimum slope of soil subgrade shall be no less than 0.5 percent and shall not exceed 12 percent. Where subgrades slopes exceed 2 percent, bench subgrade and provide impermeable flow barriers to slow down flow.

G. If aggregate is to be used as a flow barrier, it shall be open-graded clean stone, free from sediment, debris and fines and must be wrapped in an impermeable geomembrane.

3.2 INSPECTIONS

A. Prior to commencement of any work, the Contractor shall conduct a pre-construction meeting with the Owner, Engineer and affected sub-trades. At a minimum, the pre-construction meeting should cover the following:
   1. Necessary traffic control and staging plans, permitting and notification required by Contractor;
   2. Location of the required Mock Up and whether it will be part of the final construction or will need to be removed;
   3. Verify site layout conforms to the drawings. Specifically, the location and elevation of discharge points for the underdrains;
   4. Excavation work should conform to the specified lines and elevations. Subgrade shall be trimmed to within 0 and ½ inches of the specified grades. The surface of the prepared Subgrade shall not deviate by more than 3/8 of an inch from the bottom edge of a 10-foot straight edge laid in any direction;
   5. Protection of the subgrade where infiltration is desired. Heavy equipment shall not adversely impact subgrade during excavation work. Where compaction is necessary, recommended densities per the geotechnical engineer must be met;
   6. Locations of curbs, grade beams, utility structures, light standards, tree wells or any other protrusions as applicable to the project;
   7. The details of the 'Erosion Control Plan'; and
   8. Locations of Geosynthetics with any protrusions through the Membrane Liner where boots are required.

B. Although the Owner will provide soil testing and quality assurance inspection during earthwork and subgrade preparation, the Owner's quality assurance program does not relieve the Contractor of the responsibility for quality control and system performance. Contractor shall obtain any quality control testing or inspection not provided by the Owner that is necessary to satisfy the Contractor with the condition of the subgrade prior to commencement of the work. This may include:

1. Proof rolling of the subgrade to determine presence of soft spots or localized pockets of objectionable materials;
2. Infiltration testing to verify the subgrade has not been adversely impacted; and
3. Compaction testing where identified by the geotechnical engineer.

C. Where deficiencies or inconsistencies are identified, the Contractor shall notify the Engineer in writing. The Contractor may not proceed with the work until Engineer has verified the deficiencies or inconsistencies have been addressed.

D. Beginning of installation means acceptance of Subgrade.

3.3 INSTALLATION BASE COURSE

A. Keep area where pavement is to be constructed free from sediment during the entire job. Any materials contaminated with sediment shall be removed and replaced with clean material.

B. Install membrane liners in accordance with manufacturer's recommendations. Where required, membrane liners shall be applied to the bottom and sides of the excavation. Membrane liner shall exceed the final elevation of the surface and the excess liner shall be cut flush with finished grade.

C. Install geotextiles as required in accordance with the specifications and drawings. The geotextile is applied to the bottom and sides of the excavation with overlapping joints a minimum of 12 inches. Overlaps to follow down slope. Allow for enough geotextile to exceed the final elevation of the surface. After completion of the surface, the excess geotextile should be cut flush with the finished grade,

D. Install the sub-base course and base course at the thicknesses, compaction rates, surface tolerances, and elevations outlined herein.
1. Place and spread first layer of sub-base without displacing or damaging the geosynthetics (if used). To prevent damage, tracked vehicles must not be used to spread initial sub-base layer.
2. Aggregate shall be spread and compacted in uniform layers not exceeding 6 inch loose thickness. Compaction is performed using either a 10 T (10 ton) vibratory roller or a minimum 13,500 lbf centrifugal force reversible vibratory plate compactor. For each lift, make at least two passes in the vibratory mode and at least two passes in the static mode – continue compaction until there is visible movement in the materials.
3. At the specified elevation(s), install underdrain pipes in accordance with the manufacturer's recommendations. Ensure underdrain pipes are properly sloped to provide positive drainage and are surrounded by 4 inches (min.) of base course material to prevent damage from sub-base material. Care must be taken not to damage underdrain pipes during subsequent aggregate installation.
4. Final surface tolerance: plus or minus 1 inch over a 10 foot straight edge laid in any direction.
5. Provide proper compaction near curbs, grade beams, concrete collars around utility structures, lights standards, tree wells, building edges and other protrusions as applicable to the project. In areas not accessible to large compaction equipment, compact to specified density with mechanical tampers (jumping jacks).

E. Before commencing bedding course, base course shall be inspected by the Owner.

3.4 INSTALLATION OF EDGE RESTRAINTS

A. Provide adequate edge restraints along perimeter of all paving as specified. The face of the edge restraint, where it abuts pavers, shall be vertical.

B. All concrete edge restraints shall be constructed to the dimensions and elevations specified and shall be supported on a compacted base no less than 4 inches thick.

C. Concrete used for the construction of edge restraints shall be air-entrained and have a minimum 28 day compressive strength of 4,000 psi. All concrete shall be in accordance with ASTM C94 requirements.

3.5 INSTALLATION OF BEDDING COURSE, CONCRETE PAVERS AND PERMEABLE JOINT MATERIAL

A. Spread the bedding course evenly over the base course and screed to a nominal thickness of 2 inches. Do not use the bedding material to fill depressions in the base course surface.

B. Contractor shall screed the bedding course using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards.

C. Moisten and lightly compact the bedding course using a plate compactor. Surface tolerances shall be 3/8 inch over a 10-foot straight edge.

D. Loose screed the bedding course.

E. Ensure that concrete pavers are free of foreign material before installation. Concrete pavers shall be inspected for color distribution and all chipped, damaged or discolored pavers shall be replaced. Initiation of paver placement shall be deemed to represent acceptance of the pavers.

F. Mechanically install concrete pavers in a 90 degree herringbone pattern(s). Maintain straight pattern lines and follow approved stitching details as submitted and approved during the mock up.

G. As mechanical installation work proceeds and prior to compacting pavers, remove half pavers or ‘place holders’ around perimeter of layers or clusters and replace with full-size pavers to create a fully stitched pattern that continuously interlocks reflecting no indication of layer or cluster lines providing a high degree of interlock.

H. To help reduce waste materials and labor costs, layers or clusters should be made without half units. When packaged as cubes, the vertical, half paver openings on their sides should be filled with a ‘place holder’ to remain stable during shipment.

I. Paving units shall be installed from a minimum of 3 bundles for hand installations and 6 bundles for mechanical installations, simultaneously to ensure color blending.

J. Joints between individual pavers shall be maintained according to the spacer bars.

K. Adjust pattern at pavement edges such that cutting of edge pavers is minimized. Fill gaps at edges of paved areas with cut pavers or edge units.

L. All pavers exposed to vehicular tires shall be no smaller than one third of a whole paver. Do not install cut pavers smaller than one-third of a whole paver along edges subject to vehicular traffic.

M. Cut pavers using masonry saw. Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure the pavers are not damaged during compaction.

N. Using a low amplitude plate compactor capable of at least 5,000 lbs. (22 kN) compaction at a frequency of 75 hz –100 hz, compact and seat the Concrete Pavers into the bedding course.

O. Pavers shall be compacted to achieve consolidation of the bedding course and brought to level and profile by not less than three passes. Initial compaction should proceed as closely as possible following the installation of the paving units and prior to the acceptance of any traffic or application of Permeable Joint Material.

P. Any units that are structurally damaged during compaction shall be immediately removed and replaced.

Q. Apply a dressing of Permeable Joint Material to the surface and sweep into the joints and voids. Fill joints and voids, then sweep off excess material before vibrating the material down into the joints using a plate compactor. This will require at least two or three passes with the compactor.

R. Do not compact within 6 feet of the unrestrained edges of the paving units.

S. All work to within 3 ft (1 m) of the laying face must be left fully compacted at the end of each day. Cover the laying face with plastic sheets overnight if not closed with cut and compacted pavers.

T. Sweep off excess aggregate when the job is complete; no loose material at curbs.

U. Protect paver system from clogging of sediment and debris throughout construction.

3.6 QUALITY ASSURANCE/QUALITY CONTROL

A. Contractor must designate a utility coordinator for the project. The designated utility coordinator will be responsible for working with the City and outside utilities to facilitate resolution of conflicts encountered during construction.

B. Quality Assurance - Owner will engage inspection and testing services to provide quality assurance and testing services throughout construction. Such testing services will involve routine testing for subgrades, compaction and concrete testing. As such, this does not relieve the Contractor from securing any additional construction quality control testing that may be required for the project.

C. Quality Control – The Contractor shall engage inspection and testing services to perform any retesting and any additional quality control testing required. Only qualified and experienced technicians and engineers shall perform testing and inspection services.

3.7 AS-BUILT CONSTRUCTION TOLERANCES

A. Final inspection shall be conducted to verify conformance to the drawings after removal of excess aggregate. All pavements shall be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.

B. Final surface elevations shall not deviate more than +/- 1/4 inch under a 10 ft long straight edge.

C. Lippage shall be no greater than 1/8 inch difference in height between adjacent pavers.

D. Bond lines for the pavers shall be +/- ½ inch over a 50 foot string line.

3.8 PROTECTIONS AND MAINTENANCE

A. At the completion of the work, the Contractor shall provide the Owner with a "PICP System Maintenance Checklist" and sample "Long Term Performance and Maintenance Agreement" from the Manufacturer.

B. At the completion of the work, the Contractor and or paver Manufacturer shall provide certified training for designated City staff related to PICP installation, maintenance and repair activities. Future repairs associated with aging infrastructure, such as utilities, are anticipated and City staff must be trained and certified for such repairs and maintenance.

C. Contractor shall return after 6 months, 12 months, 24 months and 36 months from the date of substantial completion and conduct an inspection with the Owner and Manufacturer in accordance with the "PICP System Maintenance Checklist". Contractor shall provide the following remedial work, as required, as part of the original bid and with no additional compensation: fill paver joints with stones; replace broken or cracked pavers; re-level settled pavers to specified elevations, ensure required tolerances are maintained and re-align pavers to straighten bond lines.

END OF SECTION

ISSUED	DATE
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. Extent:
1. Furnish all labor, materials, and equipment for the proper installation of the irrigation system. The work includes, but is not necessarily limited to the following:
   a. Shop drawings.
   b. Product information.
   c. Trenching and backfill.
   d. Automatically controlled irrigation system.
   e. Test all systems and make operative.
   f. As-built drawings.
   g. 24-volt electrical work.
   h. Sleeve and boring.

B. General:
1. Contractor shall keep one (1) copy of these Specifications with foreman, when present on job site, until job has passed final inspection.
2. Obtain all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be furnished to the Owner's Representative to show all work has been installed in accordance with the ordinances and code requirements.
3. Wherever the terms "approval" or "approved" are used in the specification, they shall meet the approval of the Owner's Representative in writing.
4. Before any work is started, a conference shall be held between the General Contractor, Irrigation Contractor, Landscape Contractor, and Owner's Representative concerning the work under this Contract.
5. Coordinate and cooperate with other Contractors to enable the work to proceed as rapidly and efficiently as possible.
6. Contractor shall acquaint themselves with all site conditions. Contractor shall be responsible for locating all underground utilities. Failure to do so will make Contractor liable for any and all damage thereto arising from their operations subsequent to discovery of such utilities not shown in the plans.
7. Contractor shall take all necessary precautions to protect existing site conditions. Should damage be incurred, the Contractor shall repair the damage to its original condition at his own expense.
8. The Owner or Owner's Representative reserves the right to add or delete any materials or work as the work progresses. Adjustment to the Contract price shall be negotiated or corrected before continuing with installation.
9. The Owner or Owner's Representative reserves the right to reject materials or work which does not conform to the Contract Documents. Rejected work shall be removed or corrected within 48 hours of written notification.
10. Provide an installed, operational subsurface drip irrigation (planting beds) and spray head (turf areas) system using equipment provided by “approved” manufacturers as much as

possible. System is to be fed by underground cistern and pump shown by the Utility Drawings. Extent of irrigation coverage is shown by the Landscape Drawings.

C. System Design: Irrigation system shall be designed to deliver water to the furthest irrigation head at minimum of 30 PSI with each zone capable of distributing 35 GPM.

1.2 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Irrigation Main Piping: Downstream from point of connection of water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

1.3 SUBMITTALS

A. Product Data: Submit the following in accordance with Section 01 3300 Submittals. Include pressure ratings, rated capacities, and settings of selected models for the following:
1. Isolation valves.
2. Control valves.
3. Control-valve boxes.
4. Rain Gauge.
5. Controllers.
6. Irrigation wiring.
7. Irrigation piping and fittings.
8. Solvents.

B. Shop Drawings: Show hydraulic calculations for each zone, irrigation system piping, including plan layout, and locations, types, sizes, capacities, and flow characteristics of irrigation system piping components. Include locations of water meters, backflow preventers, isolation valves, circuit valves, piping, drip tubing and emitters, rain gauge, irrigation controller, and wiring paths and splices. Show areas of sprinkler spray and overspray. Show wire size and number of conductors for each control cable. All valves shall be numbered in a logical manner and labeled with the valve size, valve gpm, valve psi, and number of heads per valve.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI, ASTM, FED, SPEC. Standards and Specifications and all applicable building codes and requirements of other public agencies having jurisdiction upon the work.

1. National Electric Code.

WARRANTY

B. Fully warrant irrigation system for a period of one full and consecutive operating season of April 15 through October 15, after written final acceptance.

C. During the warranty period, the Contractor shall enforce all manufacturer's and suppliers warranties as if made by the Contractor. Any malfunctions, deficiencies, breaks, damages, disrepair, defects or other disorder due to materials, workmanship, or installation by the Contractor shall be immediately and properly corrected.

D. Repair damages to other improvements and plantings caused by system malfunctions, at no additional expense to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPES, TUBES, AND FITTINGS

A. PVC Pipe: ASTM D 1785, PVC 1120 compound, Class 200.
1. PVC Socket Fittings, Schedule 40: ASTM D 2466.

B. PE, Controlled OD Pipe: ASTM F 771 and ASTM D 3035, PE 3408 compound, DR 9 and DR 11.
1. PE Socket Fittings: ASTM D 2683.
2. PE Butt-Fusion Fittings: ASTM D 3261.

C. Detectable Metallic Underground Tape: Aluminum foil encased in blue plastic tape imprinted in black lettering with the words "CAUTION: IRRIGATION MAINLINE BELOW" select from the following manufacturers:
1. Empire
2. Harris Industries
3. Pollard Water
4. Ben Meadows Company
5. Approved equal.

D. Transition Fittings: Refer to Section 15 200_, Process Piping – General, for transition fittings.

E. Refer to Section 40 0513, Process Piping – General, for commonly used joining materials.

2.3 ISOLATION VALVES

A. Brass Ball Valves: MSS SP-110, two-piece brass or bronze body with full-port ball, chrome plated bronze ball; PTFR seats and a rating of 600 psig minimum CWP rating and blowout-proof stem and threaded end connections.
   1. Manufacturers:
      a. Hammond Valve.
      b. Milwaukee Valve Company.
      c. NIBCO INC.
      d. Watts Industries, Inc.
      e. Approved equal.

2.4 IRRIGATION CONTROL VALVES AND BOXES

A. Plastic Automatic Control Valves: Molded-PVC and/or glass filled body and cap, normally closed, diaphragm type with manual flow adjustment, and operated by 24-V ac solenoid. Each valve shall have integral pressure regulator which can be set manually. Valve pressure rating shall not be les than 150 psi.
   1. Manufacturers:
      a. Hunter Industries Incorporated.
      b. Rain Bird Sprinkler Mfg. Corp.
      c. Toro Company (The); Irrigation Division.

B. Quick-Couplers: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.
   1. Manufacturers:
      a. Rain Bird Sprinkler Mfg. Corp.
      b. Toro Company (The); Irrigation Division.
      c. Hunter Industries, Inc.

C. Polyethylene Control-Valve Boxes: Box and cover, with open bottom and openings for piping; designed for installing flush with grade. Include size as required for valves and service.
   1. Shape Rectangular.
   2. Cover Material: Non-potable purple reinforce polyethylene cover with design loading of 500 lb minimum over 10 by 10 inches square.
      a. Lettering: IRRIGATION CONTROL VALVE.
   3. Manufacturers:
      a. Amtex.
      b. NDS.
      c. Rain Bird Sprinkler Mfg. Corp.

D. Drainage Backfill: Graded and washed gravel or crushed stone, graded from ¼ inch minimum to ½ inch maximum.

2.5 DRIP TUBING EMITTERS

A. Description: Subsurface drip tubing and emitters. Tubing in planting beds shall be spaced 24 inches on center with emitters providing flow of 0.5 gallons per hour spaced 18 inches on center.
   1. Manufacturers:
      a. Netafim USA.
      b. Rain Bird Sprinkler Mfg. Corp.
      c. Toro Company (The); Irrigation Division.

2.6 SPRINKLER HEADS

A. Spray or rotor heads suitable for turf irrigation.
   1. Manufacturers
      a. Hunter Industries
      b. Toro Company (The), Irrigation Division
      c. Rain Bird Sprinkler Mfg. Corp.

2.7 IRRIGATION CONTROLLER

A. Manufacturers:
   1. Hunter Industries Incorporated.
   2. Rain Bird Sprinkler Mfg. Corp.
   3. Toro Company (The); Irrigation Division.

B. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.
   1. Material: Molded plastic.
   2. Mounting: Surface type for wall mounting.

C. Control Transformer: 24-V secondary, with primary fuse.

D. Controller Stations for Automatic Control Valves: Each station is variable from approximately 1 to 120 minutes with multiple start times per program and minimum of three separate irrigation programs. Include switch for manual or automatic operation of each station.

E. The controller shall include two hand held remote controls that will control irrigation operations without having to gain access to clock.

F. The controller shall have an input terminal for the installation of an automatic rain gauge shutoff device.
   1. Mini-Clik by Hunter Industries Incorporated, include Bypass Switch sensor if used on non-Hunter Industries controller.

G. Timing Device: Adjustable, 24-hour, 14-day clock, with automatic operations to skip operation any day in timer period, to operate every other day, or to operate two or more times daily.
   1. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.
   2. Nickel-Cadmium Battery and Trickle Charger: Automatically powers timing device during power outages.

H. Wiring: UL 493, Type UF-B multi-conductor, with solid-copper conductors and insulated cable; suitable for direct burial.

I. Manufacturers:
   a. American Electric Cable Co.
   b. American Insulated Wire Corp.
   c. Cerro Wire & Cable Co., Inc.
   d. Paige Electric.
   e. Precision Cable Manufacturing Co., Inc.
   f. Southwire Company.
   g. Triangle Wire and Cable Co.
   2. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.
   3. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.
   4. Splicing Materials: Use 3M DBY or DBR depending on wire gauge.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Civil Drawings for information on excavating, trenching, and backfilling.

B. Install warning tape directly above Irrigation Main Piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

C. Install piping and wiring in sleeves under roadways and parking lots as per detail. Coordinate irrigation sleeving locations with civil site work.

D. Provide minimum cover over top of underground piping according to the following:
   1. Irrigation Main Piping: Minimum depth of 24 inches below finished grade.
   2. Circuit Piping: 12 inches.
   3. Sleeves: See detail for installing irrigation sleeving.
   4. Drip Tubing: 6 inches (150 mm).

3.2 PIPING APPLICATIONS

A. Underground Irrigation Main Piping: Class 200, PVC pipe and socket fittings; and solvent-cemented joints.

B. Drip Tubing: Flexible polyethylene.

C. Sleeves: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.

D. Transition Fittings: Use transition fittings for plastic-to-metal pipe connections according to the following:
   1. Couplings:
      a. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
      b. Underground Piping NPS 2 and Larger: AWWA transition coupling.
   2. Fittings:
      a. Aboveground Piping: Plastic-to-metal transition fittings.
      b. Underground Piping: Union with plastic end of same material as plastic piping.
   3. Transition fittings are specified in Section 15 200_, Process Piping – General.

3.3 ISOLATION VALVE APPLICATIONS

A. Underground Isolation Gate Valves: Use the following:
   1. Line size brass/bronze isolation gate valve: MSS SP-80, Class 125, Type 1, non-rising-stem, bronze body with solid wedge, threaded ends, and malleable-iron handwheel.

B. Underground Isolation Ball Valves: Line size brass/bronze ball valve install in front of each molded PVC or glass filled circuit valve.

3.4 INSTALLATION

A. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.

B. Install piping free of sags and bends.

C. Install groups of pipes parallel to each other, spaced to permit valve servicing.

D. Install fittings for changes in direction and branch connections.

E. Install unions adjacent to valves and to final connections to other components.

F. Lay piping on solid subbase, uniformly sloped without humps or depressions.

G. Refer to Section 45 0513, Process Piping – General, for basic pipe joint construction.

H. Underground Gate Valves: Install in valve box with top flush with grade.

I. Control Valves: Install in control-valve box.

J. Flush main piping with full head of water and install sprinklers after hydrostatic test is completed.

K. Install surface mounted controllers to solid masonry surface with stainless steel mounting hardware not less than 48 inches (1200mm) above finished grade.

L. Install control cable in same trench as irrigation piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas if irrigation piping is installed in sleeve.

3.5 CONNECTIONS

A. Ground equipment according to Section 26 0526, Grounding.

B. Connect wiring according to Section 26 0519, Conductors.

3.6 LABELING AND IDENTIFYING

A. Control Valves: Each control valve shall be labeled with a 3-inch by 5-inch waterproof card with the following information imprinted upon the surface. Valve number, valve size, valve psi, valve gpm, model number of valve, number of heads on valve, type and model number of heads on valve width at wire tie long enough to be read aboveground, to be installed on all isolation and irrigation control valves.

B. Control and Isolation Valve Box: Each control valve box shall be labeled with a 2-inch by 4-inch brass label mounted to the top of each valve box cover with stainless steel hardware with the following information engraved into the surface. Valve number.

C. Control Wire: Each control wire shall be labeled in every valve box and wire splice box for ease of identification.

D. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over irrigation main piping, during backfilling of trenches.

3.7 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace units and retest as specified above.

3.8 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each zone.

3.9 ACCEPTANCE

A. Instruct the Owner's designated personnel in the operation of the irrigation system including adjustment of controllers and valves.

B. Upon acceptance Owner will assume operation of system, unless extended maintenance contract is mutually agreed upon.

C. Provide Owner with all manuals for products used on Project.

D. Provide Owner with CADD-drawn irrigation as-built drawings.
   1. Drawing shall indicate location of all valves, wire splice boxes, routing of mainline piping.
   2. Drawing shall indicate valve number, valve gpm and valve psi.
   3. Provide Owner with three laminated wallet size cards with the control codes for remote operation of irrigation controller.

3.10 CLEANING

A. Performing cleaning during installation of work and upon completion of the work. Remove all excess material from site at Contractor's expense.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes seeding and sodding.

B. Extent of landscape development work is shown on drawings and in schedules. In general, this work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, trees and shrubs, etc., and shall include, but not necessarily be limited to, all seed bed preparation; the supplying and placing of soil additives, seed, sod, and mulch wherever required by the drawings or directed by the Architect/Engineer; and maintenance.

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil. Refer to Division 31 Section "Earth Moving".

1.3 SUBMITTALS

A. Product Data: Refer to Division 01 Section "Submittal Procedures", for each type of product indicated.

B. Product certificates/certificates of inspection.

C. Planting Schedule: Indicating anticipated planting dates.

D. Maintenance Instructions: Submit typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s). This submittal is due to the Owner at the time of substantial completion of planting.

1.4 QUALITY ASSURANCE

A. No Substitutions: Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability from a minimum of 6 suppliers to the Landscape Architect, together with proposal for use of equivalent material.

B. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

1.6 JOB CONDITIONS

A. Pre-Installation Meeting:
   1. Prior to ordering plant material, seed, or specified products and prior to starting installation, the General Contractor shall set up a telephone conference call with the following in attendance.
      a. Landscape Architect
      b. Owner=s Representative
      c. Landscape Contractor
      d. General Contractor=s Representative

B. Proceed with the complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of turf areas required.

C. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand cultivate as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify the Landscape Architect before planting.

E. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

F. Coordination with Other Landscape Work: Plant trees and shrubs after final grades are established and prior to planting of permanent lawns, unless otherwise acceptable to Landscape Architect.

1.7 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until final acceptance, but for not less than the following periods:
   1. Seeded Lawns: 60 days from date of Substantial Completion.
   2. Sodded Lawns: 30 days from date of Substantial Completion.

B. Mow lawn as soon as top growth is tall enough to cut. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings.

PART 2 - PRODUCTS

2.1 SEED

A. Seed Species: State-certified seed of grass species, as follows:
   1. Common Bermuda Grass.

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: Tifway 419 Bermuda Grass.

2.3 OTHER SEED (TEMPORARY STABILIZATION)

A. Other Seed: Provide fresh, clean, new-crop seed complying with tolerance and germination established by Official Seed Analysts of North America.

B. Provide Seed Composed Of:
   1. Grain cover crops for erosion control: Annual Rye.

2.4 PLANTING MATERIALS

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
   1. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.
   2. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. See Division 31 Section "Earth Moving".

B. Fertilizer:
   1. Commercial Fertilizer: Complete fertilizer of neutral character furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the

contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws, with some elements derived from organic sources and containing following percentages of available plant nutrients:

a. For warm season grasses provide fertilizer with 10, percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 100 square feet of lawn area and not less than 10 percent phosphoric acid and 10 percent potassium. Provide nitrogen in a form that will be available to lawn during initial period of growth; at least 50 percent of nitrogen to be organic form, the remainder to be slow release.

b. For Cool Season Grasses and Other Seeds and Sod: Provide fertilizer with not less than 10 percent total nitrogen, 10 percent available phosphoric acid, and 10 percent soluble potash.

2. Super-Absorbent Material: Crystals or granules of non-toxic, neutral pH and non-biodegradable polymers capable of absorbing at least 100 times their weight in water. (Terawet by Terawet Corporation, 1-888-383-7293, Terra-Sorb by Plant Health Care, Inc., 1-800-421-9051, or approved equal.) Application rates to be as specified by the manufacturer for the use specified.

3. Mycorrhizal Fungal Inoculants: Provide a product containing live spores of endomycorrhizae and/or ectomycorrhizae fungi (depending upon use). Both endomycorrhizae and ectomycorrhizae inoculants shall be combined with humic acids, biostimulants, soluble sea kelp, yucca plant extracts and water absorbing get granules. Endomycorrhizae fungi shall contain the following species of fungus: Glomus Mosseae, Glomus Brasilianum, Glomus Deserticola, Glomus Clarum, Glomus Etunicatum, and Gigaspora Margarita. Ectomycorrhizae fungi shall contain the following species of fungus: Pisolithus Tinctorius, and a minimum of 4 select species of Rhizopogon. Select one of the following manufacturer:
   a. Bio-Organics, Incorporated
   b. Eco-Life, Corporation
   c. Horitcultural Alliance, Incorporated
   d. Plant Health Care, Inc.
   e. or equal

C. Mulches:
   1. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.5 PLANTING SOIL MIX

A. Planting Soil Mix: Submit proposed topsoil test results for approval.

PART 3 - EXECUTION

3.1 LAWN PREPARATION

A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply 10-10-10 fertilizer directly to subgrade before loosening.
   2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
   3. Spread planting soil mix to a depth of 6 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
   4. Delay mixing of fertilizer if planting will not follow within 5 days.
   5. The application of mycorrhizal inoculants differs depending upon plant material. Use product in accordance with the approved submittal for each type of planting required in strict accordance with suppliers instructions and recommendations.

B. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
   1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
   2. Loosen surface soil to a depth of at least of 4 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
   3. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, trash, and other extraneous matter.
   4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted within 2 days.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.2 SEEDING

A. Sow Common Bermuda Grass not less than the quantity of seed specified as scheduled.
   1. Application Rate: 2 lbs. Per 100 S.F.
   2. Type or Mix of Seed: Common Bermuda Grass.
   3. Season: April 15-July 31.

B. Annual Rye
   1. Application Rate: 4 lbs. per 1000 S.F.
   2. Type of mix of seed: Annual Rye.
   3. Season: August 1 – April 14.

C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

D. Protect all seeded areas by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

E. Hydroseeding New Lawns:
   1. Mix specified seed, fertilizer and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
   2. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate above.

3.3 SODDING

A. Sodding New Lawns:
   1. Lay sod within 72 hours from time of stripping. Do not plant dormant sod or if ground is frozen.
   2. Lay sod between March 1 and October 15 only unless soil conditions are favorable and written permission is obtained from the Architect/Engineer.
   3. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; to not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass. Lay sod on slopes with short dimension running up and down.
   4. Anchor sod on slopes, 3:1 or greater and in drainage swales to prevent slippage, with 1 by 2 wood pegs driven flush with sod.
   5. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.
   6. Two weeks after the sod is installed, top dress and thoroughly water it. Top dressing shall consist of the following:
      a. 10 pounds: 10-10-10 per 1,000 square feet
   7. No equipment, material storage, construction traffic, etc., will be permitted on newly sodded areas.
   8. Dispose of all surplus material as directed by the General Contractor.

3.4 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain lawns for not less than 3 mowings, and longer as required to establish an acceptable lawn, see "D" below.

C. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish an acceptable lawn, smooth and free of stones, weeds, and eroded or bare areas.

D. The standard of acceptability for bare areas by type of turf areas are:
   1. Erosion Control: No larger than 12 inches in any dimension, nor greater than 15 percent of the lawn.
   2. Non-Irrigated Turf: No larger than 6 inches in any dimension, nor greater than 10 percent of the lawn.
   3. Irrigated Fine Lawn: No larger than 3 inches in any dimension, nor greater than 5 percent of the lawn.

E. Extended Maintenance Period: Contractor shall provide all lawn maintenance for an additional 6 months after acceptance of the lawns for the additional fee as noted on the Bid Form and according to the Maintenance Schedule attached to the bid.

3.5 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.6 PUNCH LIST INSPECTION AND FINAL ACCEPTANCE

A. When lawn installation is completed, including maintenance, the Landscape Architect will, upon request, make an inspection to determine acceptability. Deficiencies will be noted in a punch list. The Landscape Architect will, upon request and within 60 days after planting, make a final inspection to determine completion of punch list items.

B. Landscape work may be inspected for acceptance in parts agreeable to the Landscape Architect, provided work offered for inspection is complete, including maintenance.

C. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by the Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

3.7 UNIT PRICE SCHEDULE

A. Instructions to Bidder: Submit the following schedule with the lump sum bid for system construction (as shown on the Bid Drawings).

UNIT PRICE SCHEDULE
FOR ADDITIONS OR DELETIONS TO SCOPE OF WORK

Fine Lawn – Seeded	$ _____	/acre
Fine Lawn – Sodded	$ _____	/sq.yd.
Staked Sod for Erosion Control	$ _____	/sq.yd.

Soil Amendments
(items may or may not be included within specifications for project bid)

Commercial Fertilizer	$ _____	/lb.

SAMPLE

SCHEDULE FOR LANDSCAPE MAINTENANCE:

Activity	**Frequency**	**Area**
Lawn mowing (including pre-mowing trash pick-up and post mowing cleanup of walks and streets)		
Bush hog mowing of meadow areas		
Edging :		
Line Trimmer: trees, walks, structure wall and beds		
Shove cut bed edge		
Fertilizing		
Aerating / dethatching		
Overseeding		
Top dressing		
Herbicide Application:		
Pre-emergent broad leaf		
Spot spraying		
Tractor wicking - post emergent		
broad spectrum		
Pesticide application		
Mulch renewal		
Irrigation maintenance		
Head / pattern adjustment		
Winterization		
Spring start-up		
Record keeping		

This or a similar form is to be prepared by the Landscape Contractor and submitted with each bid for extended maintenance.

SAMPLE

SCHEDULE OF PLANTING SOIL MIXTURE REQUIREMENTS:

For planting beds, provide not less than the following quantities of specified materials:

_____ parts of loose peat humus to _____ parts of topsoil by volume.

_____ lbs. of lime per 1000 sq. ft.

_____ lbs. of bonemeal per 1000 sq. ft.

_____ lbs. of super phosphate per 1000 sq. ft.

_____ lbs. of potash per 100 sq. ft.

_____ lbs. of _____ commercial fertilizer per 1000 sq. ft.

_____ lbs. of super absorbent polymer to _____ parts of topsoil by volume.

For lawn areas, provide not less than the following quantities of specified materials:

_____ parts of loose peat humus to _____ parts of topsoil by volume.

_____ lbs. of lime per 1000 sq. ft.

_____ lbs. of bonemeal per 1000 sq. ft.

_____ lbs. of super phosphate per 1000 sq. ft.

_____ lbs. of potash per 1000 sq. ft.

_____ lbs. of _____ commercial fertilizer per 1000 sq. ft.

NOTE: Add aluminum sulfate (to adjust ph of alkaline soils), sand, perlite, vermiculite, sawdust, manure or other appropriate soil amendments to above schedules depending on local conditions.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Trees.
   2. Shrubs.
   3. Ground cover.
   4. Plants.

B. Refer to Division 01 Sections for project management and coordination and Civil Drawings "Earth Moving".

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: Organic mulch.

C. Product certificates.

D. Planting Schedule: Indicating anticipated planting dates for exterior plants.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submittal is due prior to expiration of required maintenance period. This submittal is due to the Owner at the time of substantial completion of planting.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer who maintains an experienced full-time supervisor on Project site when exterior planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock." Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.

B. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.6 PROJECT WARRANTY

A. Warranty: Warrant trees and shrubs, for a period of one year after date of final acceptance, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Installer's control.

B. Maintain trees and shrubs through extended maintenance.

C. Another inspection will be conducted at end of extended warranty period, if any, to determine acceptance or rejection. Only one replacement (per tree, shrub or plant) will be required during the extended warranty period, except for losses or replacements due to failure to comply with specified requirements.

1.7 MAINTENANCE

A. Trees and Shrubs: Maintain during warranty period by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease.

B. Ground Cover and Plants: Maintain during warranty period by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings.

PART 2 - PRODUCTS

2.1 EXTERIOR PLANTS

A. Tree and Shrub Material: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   1. Provide balled and burlapped and container-grown trees and shrubs.
   2. City of Roswell will provide trees for contractor installation.
   3. Contractor shall provide shrubs, turf and grasses, and any other plants.

B. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

C. Annuals: Provide healthy, disease-free plants of species and variety shown or listed. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

D. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

2.2 PLANTING MATERIALS

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 2 inches or larger in any dimension and other extraneous materials harmful to plant growth.
   1. Provide new topsoil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds, and other litter, and free of roots, stumps, stones larger than 2 inches in any dimension, and other extraneous or toxic matter harmful to plant growth. Topsoil to have minimum 4 percent organic material established by a laboratory burn test.
   2. Obtain topsoil from local sources having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4 inches; do not obtain from bogs, marshes, or wetlands.

B. Organic Soil Amendments:
   1. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
   2. Wood Derivatives: Decomposed ground bark.
   3. Sand: Sharp, clean, washed sand, free of toxic materials.
   4. Super Absorbent Polymer: Crystals or granules of non-toxic, neutral pH and non-biodegradable polymers capable of absorbing at least 100 times their weight in water. (Terawet by Terawet Corporation, 1-888-383-7293; Terra-Sorb by Plant Health Care, Inc., 1-800-421-9051, or approved equal.) Application rates to be as specified by the manufacturer for the use specified.

5. Mycorrhizal Fungal Inoculants: Provide a product containing live spores of endomycorrhizae and/or ectomycorrhizae fungi (depending upon use). Both endomycorrhizae and ectomycorrhizae inoculants shall be combined with humic acids, biostimulants, soluble sea kelp, yucca plant extracts and water absorbing get granules. Endomycorrhizae fungi shall contain the following species of fungus: Glomus Mosseae, Glomus Brasilianum, Glomus Deserticola, Glomus Clarum, Glomus Etunicatum, and Gigaspora Margarita. Ectomycorrhizae fungi shall contain the following species of fungus: Pisolithus Tinctorius, and a minimum of 4 select species of Rhizopogon. Select one of the following manufacturer:
   a. Horticultural Alliance, Inc. (1-800-628-6373)
   b. Plant Health Care, Inc. (1-800-421-9051)
   c. Roots, Inc. (1-800-342-6173)

C. Fertilizer:
   1. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
   2. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
      a. Composition: 10 lbs./1000 sq.ft. of actual nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

D. Mulches:
   1. Organic Mulch: Pine straw mulch.

2.3 MISCELLANEOUS LANDSCAPE MATERIALS

A. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

B. Stakes and Guys: Provide stakes of sound new hardwood or treated softwood, free of knot holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire not lighter than 12 gage with zinc-coated turnbuckles. Alternatively provide commercially available guying system. Provide not less than 1/2 inch diameter rubber or plastic hose, cut to required lengths and of uniform color, material and size to protect tree trunks from damage by wires.

2.4 PLANTING SOIL MIX

A. Planting Soil Mix: As shown on the detailed drawings.

PART 3 - EXECUTION

3.1 EXTERIOR PLANTING

A. Bed Establishment:
   1. Loosen subgrade of planting beds to a minimum depth of 6 inches.
   2. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   3. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
   4. Spread planting soil mix to a depth of 6 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
   5. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
   6. Add mycorrhizal inoculants to the top 8 to 10 inches of soil mixture at the time of planting, ensuring that the roots are in direct contact with the inoculated soil.
   7. Planters: Place not less than 4 inch layer of gravel in bottom of planters, install filtration/separation fabric and fill with planting soil mixture consisting of 1 part topsoil, 1 part coarse sand, 1 part peat humus, and 3 lbs. dolomitic limestone per cubic yard of mix. Place soil in lightly compacted layers to an elevation 1-1/2 inch below top of planter allowing for natural settlement.

B. Trees and Shrubs:
   1. Pits and Trenches: Excavate circular pits with sides sloped inward – see details. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base, except to break up clay hard pan. Scarify sides of plant pit smeared or smoothed during excavation. Excavate approximately three times as wide as ball diameter.
   2. Set trees and shrubs plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.
      a. Balled and Burlapped: Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
      b. Container Grown: Carefully remove root ball from container without damaging root ball or plant.
      c. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
   3. Organic Mulching: Apply thickness of organic mulch as shown on plans and details, extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

C. Tree and Shrub Pruning: Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Do not cut tree leaders;

remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

D. Ground Cover and Plant Planting:
   1. Set out and space ground cover and plants as shown or scheduled on the plans and details.
   2. Add mycorrhizal inoculants to the soil mixture at the time of planting, ensuring that the plant roots are in direct contact with the inoculated soil.
   3. Dig holes large enough to allow spreading of roots, and backfill with planting soil.
   4. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
   5. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
   6. Protect plants from hot sun and wind; remove protection when plants show evidence of recovery from transplanting shock.

E. Planting Bed Mulching:
   1. Mulch backfilled surfaces of planting beds and other areas indicated on plans and details. Finish level with adjacent finish grades. Do not place mulch against plant stems.

F. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

G. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

3.2 PUNCH LIST INSPECTION AND FINAL ACCEPTANCE

A. When landscape work is completed, including maintenance, the Landscape Architect will, upon request, make an inspection to determine acceptability. Deficiencies will be noted in a punch list. The Landscape Architect will, upon request, make a final inspection to determine completion of the punch list items.

B. Landscape work may be inspected for acceptance in parts agreeable to the Landscape Architect, provided work offered for inspection is complete, including maintenance.

C. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by the Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

3.3 UNIT PRICE SCHEDULE

A. Instructions to Bidder: Submit the following schedule with the lump sum bid for system construction (as shown on the Bid Drawings).

PLANT MATERIAL PRICE SCHEDULE
FOR ADDITIONS OR DELETIONS TO SCOPE OF WORK

Plant Common Name	Size	Unit Price
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____
		$ _____

Soil Amendments

(items may or may not be included within specifications for project bid)

Sand	$ _____	/ton
Peat Humus	$ _____	/cu.yd.
Organic Compost	$ _____	/cu.yd.
Lime	$ _____	/ton
Bonemeal	$ _____	/lb.
Super Phosphate	$ _____	/lb.
Commercial Fertilizer	$ _____	/lb

SAMPLE

SCHEDULE OF PLANTING SOIL MIXTURE REQUIREMENTS:

For planting beds, provide not less than the following quantities of specified materials:

_____ parts of loose peat moss _____ parts of topsoil by volume.

_____ lbs. of 10-10-10 commercial fertilizer per 1000 sq. ft.

_____ lbs. of super absorbent polymer to _____ parts of topsoil, by volume.

For backfill for trees and shrubs, provide specified materials in not less than the following quantities:

_____ parts of loose peat moss to _____ parts of topsoil by volume.

_____ lbs. of 10-10-10 commercial fertilizer per cu. ft. of backfill.

NOTE: Add aluminum sulfate (to adjust ph of alkaline soils), sand, perlite, vermiculite, sawdust, manure or other appropriate soil amendments to above schedules depending on local conditions.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes both potable and fire water-distribution piping and specialties outside the building for the following:
   1. Water services.

1.2 ACTION SUBMITTALS

A. Prepare submittals per requirements of Section 01 3300 – Submittal Procedures.

B. Product Data:
   1. Valves and accessories.
   2. Water meters and accessories.
   3. Backflow preventers and assemblies.

C. Shop Drawings: Submit shop drawings for water systems, showing piping materials, vaults, sizes and show clearances around piping within structures.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
   2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. NSF Compliance:
   1. Comply with NSF 14 for plastic potable-water-service piping.
   2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.4 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than three days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's/Owner's permission.

1.5 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
   2. Products: Subject to compliance with requirements, provide one of the products specified.
   3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
   4. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 of this Section, "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
   1. Copper Fittings:
      a. Pack Joint Copper Tube Size (CTS) Compression inlet x Pack Joint Copper Tube Size (CTS) Compression outlet or Pack Joint Copper Tube Size (CTS) Compression inlet x Female Iron Pipe (FIP) Thread outlet or Pack Joint Copper Tube Size (CTS) Compression inlet x Male Iron Pipe (MIP) Thread outlet. Shall conform to AWWA C800 and be lead free type.
      b. ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. PVC, Schedule 80 Pipe: ASTM D 1785.
   1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.

2.4 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, BCuP Series.

B. Soldering Flux: ASTM B 813, water-flushable type.

C. Solder Filler Metal: ASTM B 32, lead-free type.

2.5 CORPORATION VALVES AND CURB VALVES

A. Available Manufacturers:
   1. Ford Meter Box Company, Inc. (The).
   2. Mueller Co.; Water Products Div.
   3. McDonald, A. Y. Mfg. Co.
   4. City Approved Equal

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
   a. Double strap service saddles conforming to AWWA C800.
   b. Ductile iron body conforming to ASTM A536.
   c. AWWA/CC Taper Thread or Female Iron Pipe (FIP) Thread.
   d. Carbon steel straps conforming to ASTM A108.
   e. Nuts shall be heavy hex type, low carbon steel, zinc plated conforming to ASTM A563 and washers shall be SAE flat washers, low carbon steel, zinc plated conforming to ASTM F844.
   f. Fusion bonded epoxy coating conforming to AWWA C213.
   g. Heavy duty, Buna N outlet gasket.

C. Service saddle shall be NSF/ANSI Standard 61 compliant. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material. Shall be lead free type.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over curb valve, and approximately 3-inch- diameter barrel.
   1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.6 WATER METERS

A. Water meters to be provided by Roswell Water Utility District.

B. Available Manufacturers:
   1. .

2. Sensus Technologies, Inc.

C. Description: AWWA C700, displacement-type, bronze main case. Register flow in gallons.
   1. Water-Meter Boxes: ¾" Meters
      a. Water meter boxes for ¾" water meters shall be Ford Meter Box Company, Inc. Long Yoke Box Model LYLB 141-233-ROS-T with locking lid and 2" meter read hole.
   2. 1" and Larger Meters
      a. Water meter boxes for 1" and larger water meters shall be high density polyethylene or fiber reinforced plastic.
      b. Water meter box lids shall be cast iron T-cover with 2" diameter hole offset for touch read installation.
      c. Acceptable Manufacturers
         1) Carson/Oldcastle Precast Inc. Specification Grade 1220-12
         2) DFW Plastics, Inc. 1500.12.1

D. BACKFLOW-PREVENTION DEVICES

E. Available Manufacturers:
   1. Ames Co., Inc.
   2. Cla-Val Co.
   3. CMB Industries, Inc.; Febco Div.
   4. Conbraco Industries, Inc.
   5. FLOMATIC Corp.
   6. Watts Water Technologies, Inc.; Water Products Div.
   7. Zurn Industries, Inc.; Wilkins Div.

F. General: ASSE standard, backflow preventers.
   1. Working Pressure: 150 psig minimum, unless otherwise indicated.
   2. NPS 2 and Smaller: Bronze body with threaded ends.
   3. Interior Components: Corrosion-resistant materials.

G. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

H. Reduced-Pressure-Principle Backflow Preventers: AWWA C511, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2, air-gap fitting located between two positive-seating check valves.
   1. Maximum Pressure Loss: 12 psig through middle 1/3 of flow range.

2.7 PROTECTIVE ENCLOSURES

A. Available Manufacturers:

1. G&C Enclosures, Inc.
2. Hot Box, Inc.
3. HydroCowl, Inc.
4. Watts Water Technologies, Inc.; Water Products Div.

B. Protective Enclosures, General: ASSE 1060, outdoor weather-resistant enclosure designed to protect aboveground water piping equipment or specialties from vandalism. Include size and dimensions indicated but not less than those required for access and service of protected unit.

C. Freeze-Protection Enclosures: Insulated and with heat source to maintain minimum internal temperature of 40 deg F (4 deg C) when external temperatures reach as low as minus 34 deg F (minus 36 deg C).
   1. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
      a. Housing: Reinforced-aluminum or -fiberglass construction.
         1) Drain opening for units with drain connection.
         2) Access doors with locking devices.
         3) Insulation inside housing.
         4) Anchoring devices for attaching housing to concrete base.
      b. Electric heating cable or heater with self-limiting temperature control.

D. Precast concrete base of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

B. Underground Water-Service Piping: Use any of the following piping materials for each size range:
   1. NPS 3/4 to NPS 2: Soft copper tube, Type K; wrought-copper fittings; and soldered joints.
   2. NPS 3/4 to NPS 2: PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.

3.2 JOINT CONSTRUCTION

A. Make pipe joints according to the following:
   1. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.
   2. CTS Fittings AWWA C800

3. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
4. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.3 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

D. Install PVC, AWWA pipe according to AWWA M23 and ASTM F 645.

E. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.

F. Extend water-service piping and connect to water-supply source in locations and pipe sizes indicated.

G. Water Piping Installation Parallel With Sanitary Sewer Piping:
1. Normal Conditions: Water piping shall be laid at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Distance shall be measured edge to edge.

H. Installation of Water Piping Crossing Sanitary Sewer Piping:
1. Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.

I. Sanitary Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

3.4 VALVE INSTALLATION

A. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.5 WATER-METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written requirements.

B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water-meter inlets. Include valves on water-meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.

3.6 BACKFLOW-PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers with relief drain in vault or other space subject to flooding.

C. Do not install bypass piping around backflow preventers.

3.7 PROTECTIVE ENCLOSURE INSTALLATION

A. Install concrete base level and with top approximately 2 inches above grade.

B. Install protective enclosure over valves and equipment.

C. Anchor protective enclosure to concrete base.

3.8 CLEANING

A. Clean and disinfect water-distribution piping as follows:
   1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:
      a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
      b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for sanitary sewer (gravity) piping.

B. Related Sections include the following:
   1. Division 31 Earthwork Sections for excavation requirements.
   2. Division 32 Section "Asphalt Paving" for open trench installation repair work.

1.2 DEFINITIONS / STANDARDS

A. The following are industry abbreviations for metal and plastic materials:
   1. PVC: Polyvinyl chloride plastic.
   2. DIP: Ductile iron pipe.

B. Buried piping shall be of the bell and spigot, butt fusion, electrofusion, or sleeve coupling type.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated.

B. Comply with regulatory requirements of local, state and federal agencies having jurisdiction.

C. Comply with ASTM specifications for materials.

D. All ductile iron pipe shall be the product of one American based manufacturer with a minimum of five (5) years of experience in manufacturing the size, class, and quantity of pipe specified herein. The manufacturer must have a successful performance record on projects of comparable scope and magnitude.

E. Polyvinyl chloride (PVC) and molecularly oriented polyvinyl chloride (PVCO) pipe shall have proper markings which include manufacturer's name or trademark, nominal pipe size and size base, pressure rating for water at 73.4 degrees Fahrenheit, PVC cell classification or material code, dimension ratio or standard dimension ratio, AWWA or ASTM designation, pressure class with which the pipe complies, and the National Sanitation Foundation (NSF) Seal of Approval for drinking water (when applicable).

F. Customer Inspection:
   1. The Owner, Engineer, or designated representative(s) shall be entitled to inspect pipes and witness the pipe manufacturing.

1.4 PRODUCT STORAGE, AND HANDLING

A. Delivery: Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Storage:
   1. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

C. Handling:
   1. Protect flanges, fittings, and specialties from moisture and dirt.

1.5 GENERAL REQUIREMENTS

A. Pipe material for sewer lines shall be ductile iron for mains unless otherwise shown on the drawings. Services shall be ductile iron or PVC unless otherwise shown on drawings.

B. Refer to other sections for items affecting gravity sewers. Coordinate this work with that specified by other sections for timely execution.

C. Each type of gravity pipe and fittings (PVC, DIP, etc.) supplied under this section shall be provided by the same manufacturer.

PART 2 - PRODCUTS

2.1 DUCTILE IRON PIPE

A. Ductile iron pipe and fittings for main line sewer will be supplied by Owner.

B. Ductile iron pipe and fittings for service line sewer, including incidental replacement required to reconnect existing services, will be supplied by Contractor.

C. Ductile iron pipe shall conform to the requirements of ANSI 21.151/AWWA C151 latest revision for ductile iron pipe centrifugally cast in metal or sand-lined molds. It shall be made and tested in accordance with ASTM A536, latest revision. The pipe shall be able to withstand a hydrostatic pressure of 500 psi.

D. The design thickness shall be that specified by ANSI A21.50/AWWA C150 latest revision except that all pipe with a diameter of 12 inches or less shall be Pressure Class 350 and all pipe with a diameter 14 inches or greater shall be Pressure Class 250 unless determined otherwise by the Owner or Engineer.

E. The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket shall have a flared design so that maximum deflection will be provided. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and compression of the gasket.

F. Gaskets:

1. Gaskets shall be Styrene Butadiene Copolymer (SBR) or Ethylene Propylene Diene Monomer (EPDM) in accordance with ANSI A21.11/AWWA C111, latest revision made in the form of a solid ring to exact dimensions.
    a. Push-on Joint Gaskets: The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressures.
        1) Manufacturer / Model:
            a) American Ductile Iron Pipe "Fastite,"
            b) U.S. Pipe "Tyton," or
            c) Approved equal.
    b. Push-on Restrained Joint Gaskets: Restrained pipe and fittings are as shown on the Drawings. Retainer glands and similar devices will not be allowed unless otherwise noted or shown on the Drawings or approved by the Engineer. Push-on joint restraint shall be incorporated in the design of the pipe bell and gasket. The restraint shall be provided by the wedging action developed between pairs of hardened high-strength, stainless steel elements spaced around the gasket. The push-on restrained joint shall be rated for 250 psi working pressure.
        1) Manufacturer / Model:
            a) American Ductile Iron Pipe "Fast-Grip" (for pipe sizes 24-inch and less),
            b) U.S. Pipe "Field Lok" Gaskets (for pipe sizes 24-inch and less),
            c) American Ductile Iron Pipe "Flex-Ring" (for pipe sizes 30 and 36 inch),
            d) American Ductile Iron Pipe "Lok-Ring" (for pipe sizes greater than 46 inches),
            e) U.S. Pipe "TR Flex" (for pipe sizes 24-inch and larger), or
            f) Approved equal.
2. Lubricant: Lubricant shall be furnished with each order to provide for the proper installation of the pipe supplied with said order. This lubricant shall be nontoxic, impart no taste or smell to the water, and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.

G. Welded-on Outlets:

1. Welded-on outlets shall be limited to branch outlets having a nominal diameter less than 70 percent of the nominal diameter of the main line pipe or 30-inch whichever is smaller as shown in the following table.

Main Line Nominal Diameter	Branch Outlet Nominal Diameter
10 inch	6 inch
12 inch	8 inch
14 inch	8 inch
16 inch	10 inch
18 inch	12 inch
20 inch	14 inch
24 inch	16 inch
30 inch	20 inch
36 inch	24 inch
42 inch	30 inch
48 inch	30 inch
54 inch	30 inch

2. Parent pipe and branch outlet candidate pipe shall be centrifugally cast ductile iron designed in accordance with ANSI A21.50/AWWA C150 and manufactured in accordance with ANSI A21.51/AWWA C151. Minimum classes shall be: for sizes 4-inch through 54-inch, Special thickness Class 53; for sizes 60-inch through 64-inch, Pressure Class 350.
3. Welded-on outlets may be provided as a radial tee outlet, tangential outlet, or lateral outlet fabricated at a specific angle to the main line pipe in 1 degree increments between 45 degrees and 90 degrees from the axis of the main line pipe as shown on the Drawings.
4. All welded-on outlets shall be rated for a working pressure of 250 psi and must have a minimum safety factor of 2.0 based on proof of design hydrostatic test results.
5. The joints on welded-on branch shall meet, where applicable, the requirements of ANSI A21.11/AWWA C111 and/or ANSI A21.15/AWWA C115. The joint materials (glands, gaskets, and studs) shall be furnished where applicable.
6. Weldment for welded-on outlets shall be based on the method described in Section VIII of the ASME Unfired Pressure Vessel Code. Reinforcing welds shall be placed using Ni-Rod 55 cored wire or Ni-Rod 55 electrodes manufactured by INCO Alloys (or an electrode with equivalent performance properties). Carbon Steel electrodes are not acceptable.
7. Prior to the application of any coating or lining in the outlet area all weldments for branch outlets to be supplied on this project shall be subjected to an air pressure test of at least 15 psi. Air leakage is not acceptable. Any leakage shall be detected by applying an appropriate soapy water solution to the entire exterior surface of the weldment and adjoining pipe edges or by immersing the entire area in a vessel of water and visually inspecting the weld surface for the presence of air bubbles. Any weldment that shows signs of visible leakage shall be repaired and retested in accordance with the manufacturer's written procedures.

8. Welded-on outlets shall be fabricated by the pipe manufacturer at the same facility where the pipe is produced. The pipe manufacturer shall have a minimum of 5 years of experience in the fabrication and testing of outlets of similar size and configuration.
9. The manufacturer shall have a fully documented welding quality assurance system and maintain resident quality assurance records based on ANSI/AWS D11.2, the Guide for Welding Iron Castings. The manufacturer shall maintain appropriate welding procedure specifications (WPS), procedure qualification (PQR), and welder performance qualification test (WPQR) records as well as appropriate air test logs documenting air leakage tests.

H. Manufacturer:
1. American Ductile Iron Pipe,
2. Griffin Pipe Products,
3. McWane,
4. U.S. Pipe, or
5. Approved equal.

2.2 DUCTILE IRON FITTINGS

A. Standard and special fittings shall be Pressure Class 350 ductile iron. Use standard mechanical joint fittings or anchoring tees at hydrant locations. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110, latest revisions.

B. All buried fittings shall be push-on or mechanical joint. Non-buried fittings shall be flanged unless otherwise shown on Drawings or directed by the Engineer. Where flanged pipe is shown, no substitution of a Uni-Flange type joint will be used without prior approval of the Engineer. Where push-on joint fittings are used, the fittings must be rodded to an anchor (i.e. dead-man, valve, etc.), have a mechanical joint fitting restraining device, or push-on restrained joint gasket.

C. Manufacturer:
1. Tyler/Union,
2. American Ductile Iron pipe, or

D. Approved equal.

2.3 POLYVINYL CHLORIDE PLASTIC (PVC) PIPE

A. PVC plastic pipe shall conform to the latest edition of ASTM Specification – D3034 for 4" through 15" diameter pipe, ASTM Specification F679 for 18" through 48" diameter pipe, AWWA C900, and/or AWWA C905, as appropriate; Standard Dimension Ratios (SDR); Maximum Length – 20 feet. PVC Pipe, 3 inches and smaller shall conform to the latest edition of ASTM D 1785 Schedule 80 with solvent weld joints.

B. Joints shall be integral bell and spigot type joints conforming to ASTM D-3139. Elastomeric gasket shall conform to the requirements of ASTM F-477. Gaskets shall be part of a complete pipe section and purchased as such. Lubricant shall be as recommended by the pipe or fitting manufacturer and shall not adversely affect the potable qualities of the water to be transported.

C. PVC pipe shall have the following pipe stiffness ratings unless specified otherwise:

SDR	Pipe Stiffness (psi)
35	46
26	115
23.5	135

D. Manufacturer:
1. Diamond,
2. Vulcan Plastic Corporation,
3. North American Pipe Corporation, or
4. Approved equal

2.4 POLYVINYL CHLORIDE PLASTIC (PVC) FITTINGS

A. Unless otherwise noted on the Drawings, all fittings shall be ductile iron.

B. When PVC fittings are allowed, the fittings shall be constructed of the same plastic material and have the same minimum pressure rating as the pipe being connected. The fittings shall of the molded type or machined from extruded stock.

C. PVC fittings, adaptors, or appurtenances shall be furnished, as required, to connect the plastic pipe to cast or ductile iron valves, fittings, and pipe.

2.5 MANHOLES

A. Manholes will be supplied by Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

B. Gravity Flow Piping Applications: Include watertight joints.
1. NPS 4 to NPS 10: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.

C. Sleeve-Type Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

D. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

E. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

F. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

G. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

H. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 1.0 percent, unless otherwise indicated.
   2. Install piping with 36-inch minimum cover.

I. Extend sanitary sewerage piping and connect to building's drains, of sizes and in locations indicated. Terminate piping as indicated.

J. Pipe Joint Construction and Installation: Join and install pipe and fittings according to installations indicated.
   1. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
   2. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

K. Manhole Installation: Install complete with appurtenances and accessories indicated.
   1. Form continuous concrete channels and benches between inlets and outlet.
   2. Set tops of frames and covers flush with finished surface of manholes, unless otherwise indicated.
   3. Install precast concrete manhole sections with gaskets according to ASTM C 891.

L. Concrete Placement: Place cast-in-place concrete according to ACI 318 and ACI 350R.

M. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

N. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

O. Set cleanout frames, manhole covers in pavement with tops flush with pavement surface, and sloped to match finish grades.

P. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

Q. Installation of Sanitary Piping Crossing a Water Line:
   1. Normal Conditions: Lay sanitary piping crossing water lines to provide a separation of at least 18 inches between the top of the sanitary piping and the bottom of the water line whenever possible.
   2. Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:
      a. Sanitary piping passing over or under water lines shall be constructed of AWWA-approved water pipe, pressure tested in place without leakage prior to backfilling.
      b. Sanitary piping passing over water lines shall, in addition, be protected by providing:
         1) A vertical separation of at least 18 inches between the bottom of the sanitary piping and the top of water line.
         2) Adequate support for the sanitary piping to prevent excessive deflection of the joints and the settling on and breaking of water line.
         3) That the length (minimum 18 feet) of the sanitary piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the water line.

R. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

S. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

T. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

U. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. Place plug in end of incomplete piping at end of day and when work stops.
   2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

3.2 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   3. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate reports for each test.
   5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
      a. Sanitary Sewerage: Perform air test according to UNI-B-6.
   6. Manholes: Perform hydraulic test according to ASTM C 969.
   7. Leaks and loss in test pressure constitute defects that must be repaired.
   8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.3 CLEANING

A. Clean interior of piping of dirt and superfluous material and flush with clean water.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes storm drainage outside the building.

B. Related Sections include the following:
   1. Division 33 Section "Subdrainage" for foundation drains connecting to storm drainage.
   2. Division 31 Section "Earth Moving".

1.2 DEFINITIONS

A. RCP: Reinforced concrete pipe.

B. PE: Polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

1.3 SUBMITTALS

A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Precast concrete manholes and other structures, including frames, covers, and grates.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast concrete manholes and other structures according to manufacturer's written instructions.

1.5 PROJECT CONDITIONS

A. Site Information: Perform site reconnaissance, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than seven days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Plastic, Channel Drainage Systems:
   a. ACO Polymer Products, Inc.
   b. Advanced Drainage Systems, Inc.
   c. Contech Engineered Solutions LLC
   d. MultiDrain Corp.
   e. NDS, Inc.
   f. Tuf-Tite, Inc.
   g. Zurn Industries, Inc.; Hydromechanics Div.
2. Gray-Iron Backwater Valves, Cleanouts, and Drains:
   a. Josam Co.
   b. McWane, Inc.; Tyler Pipe; Wade Div.
   c. MIFAB.
   d. Smith: Jay R. Smith Mfg. Co.
   e. Watts Industries, Inc.; Ancon Drain Div.
   f. Watts Industries, Inc.; Enpoco, Inc. Div.
   g. Zurn Industries, Inc.; Hydromechanics Div.
3. PVC Backwater Valves, Cleanouts, and Drains:
   a. Canplas, Inc.
   b. IPS Corp.
   c. NDS, Inc.
   d. Nyloplast America, Inc. (A Division of Advanced Drainage Systems, Inc.)
   e. Plastic Oddities, Inc.
   f. Sioux Chief Manufacturing Co., Inc.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

A. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
2. Gaskets: AWWA C111, rubber.

B. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silttight joints.

C. PVC Sewer Pipe and Fittings: According to the following:
   1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.
   2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
      a. Gaskets: ASTM F 477, elastomeric seals.

D. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for gasketed joints.
   1. Gaskets: ASTM C 443, rubber.

2.4 SPECIAL PIPE COUPLINGS AND FITTINGS

A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
   1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
   2. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
   3. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
   4. Bands: Stainless steel, at least one at each pipe insert.

B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or Elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.
   1. Material for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
   2. Material for Plastic Pipe: ASTM F 477, Elastomeric seal.
   3. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

2.5 STORM DRAINAGE STRUCTURES

A. Normal-Traffic Precast Concrete: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
   1. Dimensions: 48 inches minimum, unless otherwise indicated.
   2. Base Section: 8-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   3. Riser Sections: 5-inch minimum thickness, and lengths to provide depth indicated.
   4. Manhole Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

5. Gaskets: ASTM C 443, rubber, or as noted.
6. Grade Rings: Include reinforced-concrete rings, of 9-inch maximum thickness, that match 24-inch- diameter frame and cover. Brick may be used for grade rings.
7. Steps: Fiberglass or polypropylene individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Cast-in-Place Concrete: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Grade Rings: Include reinforced-concrete rings, of 9-inch maximum total thickness, that match 24-inch- diameter frame and cover. Brick may also be used for grade rings.
2. Steps: Fiberglass or polypropylene individual steps. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.

C. Manhole Frames, Grates, and Covers: ASTM A 48, Grade 60-40-18, gray-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

D. Frames and Grates: ASTM A 48, Grade 60-40-18, gray iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.6 STORMWATER INLETS

A. Area Inlets: Made with horizontal opening, of materials and dimensions according to utility standards when appropriate. Include heavy-duty frames and grates.

B. Curb Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards when appropriate. Include heavy-duty frames and grates.

C. Frames and Grates: Heavy-duty frames and grates according to utility standards when appropriate.

2.7 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 3000 psi minimum, with 0.45 maximum water-cementitious ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 3000 psi minimum, with 0.45 maximum water-cementitious ratio.
   1. Include channels and benches in manholes.
      a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
         1) Invert Slope: 1 percent minimum through manhole.
      b. Benches: Concrete, sloped to drain into channel.
         1) Slope: 8 percent minimum.
   2. Include channels in catch basins.
      a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
         1) Invert Slope: 1 percent minimum through catch basin.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.8 PLASTIC, CHANNEL TRENCH DRAINAGE SYSTEMS

A. General: Modular system of plastic channel sections, grates, and appurtenances; designed so grates fit into frames without rocking or rattling. Include number of units required to form total lengths indicated.

B. Fiberglass Systems: Include the following components:
   1. Channel Sections: Interlocking-joint, fiberglass modular units, with built-in invert slope of approximately 1 percent and with end caps. Include rounded or inclined inside bottom surface, with outlets in number, sizes, and locations indicated.
      a. Width: Nominal 6 inches.

2. Factory- or field-attached frames that fit channel sections and grates.
   a. Material: Manufacturer's standard metal.
3. Grates with slots or perforations that fit frames.
   a. Material: Gray iron.
4. Covers: Solid gray iron, if indicated.
5. Drainage Specialties: Include the following plastic components:
   a. Large Catch Basins: 24-inch- square plastic body, with outlets in number and sizes indicated. Include gray-iron frame and slotted grate.
   b. Small Catch Basins: 12-by-24-inch plastic body, with outlets in number and sizes indicated. Include gray-iron frame and slotted grate.

C. PE Systems: Include the following components:
1. Channel Sections: Interlocking-joint, PE modular units, 4 inches wide, with end caps. Include rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
2. Grates: PE, ladder shaped; with stainless-steel screws.
3. Color: Gray, unless otherwise indicated.
4. Drainage Specialties: Include the following PE components:
   a. Drains: 4-inch- diameter, round, slotted top; with NPS 4 bottom outlet.
   b. Drains: 8-inch- diameter, round, slotted top; with NPS 6 bottom outlet.
   c. Drains: 4-inch- square, slotted top; with NPS 3 bottom outlet.
   d. Drains: 8-inch- square, slotted top; with NPS 6 bottom outlet.
   e. Area Inlets: 12-inch- square plastic body, with outlets in number and sizes indicated. Include PE slotted grate 11-3/4 inches square by 1-1/8 inches thick.

D. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

E. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.9 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications for heavy-duty applications.
1. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast0iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.10 TRENCH DRAINS

A. Gray-Iron Trench Drains: ASME A112.21.1M, 6-inch- wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular, secured grate. Include units of total lengths indicated and number of bottom outlets with inside calk or spigot connections, of sizes indicated. Use units with top-loading classifications according to the following applications:
   1. Medium Duty: In paved foot-traffic areas.
   2. Heavy Duty: In vehicle-traffic service areas.
   3. Extra-Heavy Duty: In roads.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING APPLICATIONS

A. General: Include silttight joints, unless watertight joints are indicated.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

C. Gravity-Flow Piping: Use the following:
   1. Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints. Do not use nonreinforced pipe instead of reinforced concrete pipe.
   2. PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
   3. Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.

3.3 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
   1. Use the following pipe couplings for nonpressure applications:
      a. Sleeve type to join piping, of same size, or with small difference in OD.
      b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
      c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 INSTALLATION, GENERAL

A. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

B. Use structures for changes in direction and size, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

C. Extend storm drainage piping and connect to storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

C. Install with top surfaces of components, except piping, flush with finished surface.

D. PE Pipe and Fittings: As follows:
   1. Join pipe, tubing, and fittings with couplings for silttight joints according to manufacturer's written instructions.
   2. Install according to ASTM D 2321 and manufacturer's written instructions.
   3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

E. PVC Sewer Pipe and Fittings: As follows:
   1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
   2. Install according to ASTM D 2321.

F. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
   1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
   2. Elliptical Pipe: ASTM C 877, Type I, sealing bands.
   3. Arch Pipe: ASTM C 877, Type I, sealing bands.

G. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

H. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.6 CONCRETE STRUCTURE INSTALLATION

A. General: Install manholes and structures, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of structures that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete sections with gaskets according to ASTM C 891.

E. Construct cast-in-place structures as indicated.

3.7 STORM DRAINAGE INLET AND OUTLET INSTALLATION

A. Construct inlets to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.9 PLASTIC TRENCH DRAIN SYSTEM INSTALLATION

A. Assemble and install components according to manufacturer's written instructions.

B. Install with top surfaces of components, except piping, flush with finished surface.

C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

E. Fasten grates to channel sections if indicated.

F. Assemble trench sections with flanged joints.

G. Embed trench sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from pipe to cleanout at grade. Use cast-iron soil pipe fittings in pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in pipe.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops flush with surrounding finished grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.11 TRENCH DRAIN INSTALLATION

A. Install type of drains in locations indicated.

B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

3.12 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

E. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
   1. Close open ends of piping with at least 8-inch- thick, brick masonry bulkheads.
   2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Structures: Excavate around structure as required and use one procedure below:
   1. Remove structure and close open ends of remaining piping.
   2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
   3. Backfill to grade according to Division 31 Section "Earth Moving."

3.14 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. In large, accessible piping, brushes and brooms may be used for cleaning.
   2. Place plug in end of incomplete piping at end of day and when work stops.
   3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   3. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

ISSUED	**DATE**
Bid Package	05-19-17