DELAWARE STATE UNIVERSITY
CONTRACT # PC-19-008

SPECIFICATIONS
FOR

Administration Building Sidewalk and Drainage
Improvements

IN

East Dover Hundred - Kent County
Dover, Delaware

PREPARED
BY

Becker MORGAN Group

ISSUED FOR BID
06/05/2020
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INVITATION TO BID

Bids for Delaware State University Contract No. PC-19-008 – Administration Building Sidewalk and Drainage Improvements will be received electronically through email to constructionbid@desu.edu by the date and time listed below. The email subject must have the project name and contract number. Electronic response should have only one file in total. File name must start with vendors name. Aggregate size of your response without compressing the file must not be more than 5 megabytes. Do not send any unnecessary messages to this email address. Otherwise, your emails will be marked as spam thus you will fully assume the risk/ liability of no response from the University to your email messages. Bidder bears the risk of late delivery. Any bids received after the stated time will be automatically rejected.

Bidder bears the risk of incomplete response, late delivery or delivery at wrong email address of the University other than specified in this ITB. Bidder must make sure they receive confirmation stating their bid has been received. University is not responsible if bid goes into spam or is not delivered by the system whatsoever until University confirms its receipt.

There will be NO mandatory pre-bid meeting.

Project involves: Sidewalk and drainage improvements near the Administration Building located on the Main Campus as defined in the bid documents, project is funded by Capital Improvement Funds.

A Pre-Bid Meeting will be held at time and date listed below outside the north entrance of the Administration Building located on the Main Campus for the purpose of establishing the listing of subcontractors. Representatives of each party to any Joint Venture must attend this meeting.

Bidder may request an electronic copy of the bidding documents by submitting a written request to constructionbid@desu.edu. Delaware State University will track all bidders and ensure plan holder receive all addenda.

Summary of Events and Dates:

6/12/2020  Non Mandatory Pre-Bid Meeting, Outside north entrance of Administration Building (10:00AM)
6/26/2020  Deadline for Questions (10:00AM)
7/7/2020  Posting of Answers to Contractor Questions
7/22/2020  Proposals Due (3:00 PM)
8/28/2020  Anticipated Start of Construction Date (subject to change)

Note: All time listed above are the State of Delaware local time.

Bidders will not be subject to discrimination on the basis of race, creed, color, sex, sexual orientation, gender identity or national origin in consideration of this award, and Minority Business Enterprises, Disadvantaged Business Enterprises, Women-Owned Business Enterprises and Veteran-Owned Business Enterprises will be afforded full opportunity to submit bids on this contract. Each bid must be accompanied by a bid security equivalent to ten percent of the bid amount and all additive alternates. The successful bidder must post a performance bond and payment bond in a sum equal to 100 percent of the contract price upon execution of the contract. Delaware State University reserves the right to reject any or all bids and to waive any informalities therein. Delaware State University may extend the
time and place for the opening of the bids from that described in the advertisement, with not less than two calendar days’ notice.

DRUG TESTING REQUIREMENTS FOR LARGE PUBLIC WORKS

Pursuant to 29 Del.C. §6908(a)(6), effective as of January 1, 2016, OMB has established regulations that require Contractors and Subcontractors to implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds. The regulations establish the mechanism, standards and requirements of a Mandatory Drug Testing Program that will be incorporated by reference into all Large Public Works Contracts awarded pursuant to 29 Del.C. §6962. Final publication of the identified regulations can be found at the following: 4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects

END OF ADVERTISEMENT FOR BIDS
INSTRUCTIONS TO BIDDERS

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ARTICLE 1:  GENERAL

1.1 DEFINITIONS

1.1.1 Whenever the following terms are used, their intent and meaning shall be interpreted as follows:

1.2 STATE: The State of Delaware.

1.3 BOARD: The Delaware State University Board of Trustees

1.4 UNIVERSITY: The Delaware State University

1.5 AGENCY: The Delaware State University

1.6 DESIGNATED OFFICIAL: The agent authorized to act for the Agency.

1.7 BIDDING DOCUMENTS: Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement for Bid, Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the Bid Form (including the Non-collusion Statement), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, as well as the Drawings, Specifications (Project Manual) and all Addenda issued prior to execution of the Contract.

1.8 CONTRACT DOCUMENTS: The Contract Documents consist of the, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the form of agreement between the Owner and the Contractor, Drawings (if any), Specifications (Project Manual), and all addenda.

1.9 AGREEMENT: The form of the Agreement shall be AIA Document A101, Standard Form of Agreement between Owner and Contractor where the basis of payment is a STIPULATED SUM. In the case of conflict between the instructions contained therein and the General Requirements herein, these General Requirements shall prevail.

1.10 GENERAL REQUIREMENTS (or CONDITIONS): General Requirements (or conditions) are instructions pertaining to the Bidding Documents and to contracts in general. They contain, in summary, requirements of laws of the State; policies of the Agency and instructions to bidders.

1.11 SPECIAL PROVISIONS: Special Provisions are specific conditions or requirements peculiar to the bidding documents and to the contract under consideration and are supplemental to the General Requirements. Should the Special Provisions conflict with the General Requirements, the Special Provisions shall prevail.

1.12 ADDENDA: Written or graphic instruments issued by the Owner/Architect prior to the execution of the contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

1.13 BIDDER OR VENDOR: A person or entity who formally submits a Bid for the material or Work contemplated, acting directly or through a duly authorized representative who meets the requirements set forth in the Bidding Documents.

1.14 SUB-BIDDER: A person or entity who submits a Bid to a Bidder for materials or labor, or both for a portion of the Work.

1.15 BID: A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.
ARTICLE 2:  BIDDER'S REPRESENTATIONS

2.1 PRE-BID MEETING

2.1.1 A pre-bid meeting for this project will be held at the time and place designated. Attendance at this meeting is a pre-requisite for submitting a Bid, unless this requirement is specifically waived elsewhere in the Bid Documents.

2.2 By submitting a Bid, the Bidder represents that:

2.2.1 The Bidder has read and understands the Bidding Documents and that the Bid is made in accordance therewith.

2.2.2 The Bidder has visited the site, become familiar with existing conditions under which the Work is to be performed, and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

2.2.3 The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

2.3 JOINT VENTURE REQUIREMENTS
2.3.1 For Public Works Contracts, each Joint Venturer shall be qualified and capable to complete the Work with their own forces.

2.3.2 Included with the Bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Venturers involved.

2.3.3 All required Bid Bonds, Performance Bonds, Material and Labor Payment Bonds must be executed by both Joint Venturers and be placed in both of their names.

2.3.4 All required insurance certificates shall name both Joint Venturers.

2.3.5 Both Joint Venturers shall sign the Bid Form and shall submit a copy of a valid Delaware Business License with their Bid.

2.3.6 Both Joint Venturers shall include their Federal E.I. Number with the Bid.

2.3.7 In the event of a mandatory Pre-bid Meeting, each Joint Venturer shall have a representative in attendance.

2.3.8 Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the State.

2.4 ASSIGNMENT OF ANTITRUST CLAIMS

2.4.1 As consideration for the award and execution by the Owner of this contract, the Contractor hereby grants, conveys, sells, assigns and transfers to the State of Delaware all of its right, title and interests in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the Owner pursuant to this contract.

ARTICLE 3: BIDDING DOCUMENTS

3.1 COPIES OF BID DOCUMENTS

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the Architectural/Engineering firm designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein.

3.1.2 Bidders shall use complete sets of Bidding Documents for preparation of Bids. The issuing Agency nor the Architect assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.3 Any errors, inconsistencies or omissions discovered shall be reported to the Architect immediately.

3.1.4 The Agency and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall report any errors, inconsistencies, or ambiguities discovered to the Architect.

3.2.2 Bidders or Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at least seven days prior to the date for receipt of Bids. Interpretations,
corrections and changes to the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes to the Bidding Documents made in any other manner shall not be binding.

3.2.3 The apparent silence of the specifications as to any detail, or the apparent omission from it of detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and only material and workmanship of the first quality are to be used. Proof of specification compliance will be the responsibility of the Bidder.

3.2.4 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all permits, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

3.2.5 The Owner will bear the costs for all impact and user fees associated with the project.

3.3 SUBSTITUTIONS

3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of quality, required function, dimension, and appearance to be met by any proposed substitution. The specification of a particular manufacturer or model number is not intended to be proprietary in any way. Substitutions of products for those named will be considered, providing that the Vendor certifies that the function, quality, and performance characteristics of the material offered is equal or superior to that specified. It shall be the Bidder’s responsibility to assure that the proposed substitution will not affect the intent of the design, and to make any installation modifications required to accommodate the substitution.

3.3.2 Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect’s decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.

3.3.3 If the Architect approves a substitution prior to the receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding.

3.3.4 The Architect shall have no obligation to consider any substitutions after the Contract award.

3.4 ADDENDA

3.4.1 Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of the Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 No Addenda will be issued later than 4 days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.

3.4.4 Each bidder shall ascertain prior to submitting his Bid that they have received all Addenda issued, and shall acknowledge their receipt in their Bid in the appropriate space. Not acknowledging an issued Addenda could be grounds for determining a bid to be non-responsive.

ARTICLE 4: BIDDING PROCEDURES

4.1 PREPARATION OF BIDS
4.1.1 Submit the bids on the Bid Forms included with the Bidding Documents.

4.1.2 Submit the original Bid Form for each bid. Bid Forms may be removed from the project manual for this purpose.

4.1.3 Execute all blanks on the Bid Form in a non-erasable medium (typewriter or manually in ink).

4.1.4 Where so indicated by the makeup on the Bid Form, express sums in both words and figures, in case of discrepancy between the two, the written amount shall govern.

4.1.5 Interlineations, alterations or erasures must be initialed by the signer of the Bid.

4.1.6 BID ALL REQUESTED ALTERNATES AND UNIT PRICES, IF ANY. If there is no change in the Base Bid for an Alternate, enter “No Change”. The Contractor is responsible for verifying that they have received all addenda issued during the bidding period. Work required by Addenda shall automatically become part of the Contract.

4.1.7 Make no additional stipulations on the Bid Form and do not qualify the Bid in any other manner.

4.1.8 Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached, certifying agent's authority to bind the Bidder.

4.1.9 Bidder shall complete the Non-Collusion Statement form included with the Bid Forms and include it with their Bid.

4.1.10 In the construction of all Public Works projects for the State of Delaware or any agency thereof, preference in employment of laborers, workers or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State.

4.1.11 Each bidder shall include in their bid a copy of a valid Delaware Business License.

4.1.12 Each bidder shall include signed Affidavit(s) for the Bidder and each listed Subcontractor certifying compliance with OMB Regulation 4104- “Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on “Large Public Works Projects.” “Large Public Works” is based upon the current threshold required for bidding Public Works as set by the Purchasing and Contracting Advisory Council.

4.2 BID SECURITY

4.2.1 All bids shall be accompanied by a deposit of either a good and sufficient bond to the agency for the benefit of the agency, with corporate surety authorized to do business in this State, the form of the bond and the surety to be approved by the agency, or a security of the bidder assigned to the agency, for a sum equal to at least 10% of the bid plus all add alternates, or in lieu of the bid bond a security deposit in the form of a certified check, bank treasurer’s check, cashier’s check, money order, or other prior approved secured deposit assigned to the State. The bid bond need not be for a specific sum, but may be stated to be for a sum equal to 10% of the bid plus all add alternates to which it relates and not to exceed a certain stated sum, if said sum is equal to at least 10% of the bid. The Bid Bond form used shall be the standard OMB form (attached).

4.2.2 The Agency has the right to retain the bid security of Bidders to whom an award is being considered until either a formal contract has been executed and bonds have been furnished or the specified time has elapsed so the Bids may be withdrawn or all Bids have been rejected.
4.2.3 In the event of any successful Bidder refusing or neglecting to execute a formal contract and bond within 20 days of the awarding of the contract, the bid bond or security deposited by the successful bidder shall be forfeited.

4.3 SUBCONTRACTOR LIST

4.3.1 As required by Delaware Code, Title 29, section 6962(d)(10)b, each Bidder shall submit with their Bid a completed List of Sub-Contractors included with the Bid Form. NAME ONLY ONE SUBCONTRACTOR FOR EACH TRADE. A Bid will be considered non-responsive unless the completed list is included.

4.3.2 Provide the Name and Address for each listed subcontractor. Addresses by City, Town or Locality, plus State, will be acceptable.

4.3.3 It is the responsibility of the Contractor to ensure that their Subcontractors are in compliance with the provisions of this law. Also, if a Contractor elects to list themselves as a Subcontractor for any category, they must specifically name themselves on the Bid Form and be able to document their capability to act as Subcontractor in that category in accordance with this law.

4.4 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

4.4.1 During the performance of this contract, the contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, sex, color, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, sex, color, sexual orientation, gender identity or national origin.”

4.5 PREVAILING WAGE REQUIREMENT

4.5.1 Wage Provisions: In accordance with Delaware Code, Title 29, Section 6960, renovation projects whose total cost shall exceed $45,000, and $500,000 for new construction, the minimum wage rates for various classes of laborers and mechanics shall be as determined by the Department of Labor, Division of Industrial Affairs of the State of Delaware.

4.5.2 The prevailing wage shall be the wage paid to a majority of employees performing similar work as reported in the Department's annual prevailing wage survey or in the absence of a majority, the average paid to all employees reported.

4.5.3 The employer shall pay all mechanics and labors employed directly upon the site of work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics.

4.5.4 The scale of the wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work.
4.5.5 Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

4.6 SUBMISSION OF BIDS

4.6.1 Enclose the Bid, the Bid Security, and any other documents required to be submitted with the Bid in a sealed opaque envelope. Address the envelope to the party receiving the Bids. Identify with the project name, project number, and the Bidder's name and address. If the Bid is sent by mail, enclose the sealed envelope in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof. The State is not responsible for the opening of bids prior to bid opening date and time that are not properly marked.

4.6.2 Deposit Bids at the designated location prior to the time and date for receipt of bids indicated in the Advertisement for Bids. Bids received after the time and date for receipt of bids will be marked "LATE BID" and returned.

4.6.3 Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.

4.6.4 Oral, telephonic or telegraphic bids are invalid and will not receive consideration.

4.6.5 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are then fully in compliance with these Instructions to Bidders.

4.7 MODIFICATION OR WITHDRAW OF BIDS

4.7.1 Prior to the closing date for receipt of Bids, a Bidder may withdraw a Bid by personal request and by showing proper identification to the Architect. A request for withdraw by letter or fax, if the Architect is notified in writing prior to receipt of fax, is acceptable. A fax directing a modification in the bid price will render the Bid informal, causing it to be ineligible for consideration of award. Telephone directives for modification of the bid price shall not be permitted and will have no bearing on the submitted proposal in any manner.

4.7.2 Bidders submitting Bids that are late shall be notified as soon as practicable and the bid shall be returned.

4.7.3 A Bid may not be modified, withdrawn or canceled by the Bidder during a thirty (30) day period following the time and date designated for the receipt and opening of Bids, and Bidder so agrees in submitting their Bid. Bids shall be binding for 30 days after the date of the Bid opening.

ARTICLE 5: CONSIDERATION OF BIDS

5.1 OPENING/REJECTION OF BIDS

5.1.1 Unless otherwise stated, Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids will be made available to Bidders.

5.1.2 The Agency shall have the right to reject any and all Bids. A Bid not accompanied by a required Bid Security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

5.1.3 If the Bids are rejected, it will be done within thirty (30) calendar day of the Bid opening.

5.2 COMPARISON OF BIDS

5.2.1 After the Bids have been opened and read, the bid prices will be compared and the result of such comparisons will be made available to the public. Comparisons of the Bids may be based on the Base Administration Building Sidewalk and Drainage Improvements Contract No. PC-19-008
Bid plus desired Alternates. The Agency shall have the right to accept Alternates in any order or combination.

5.2.2 The Agency reserves the right to waive technicalities, to reject any or all Bids, or any portion thereof, to advertise for new Bids, to proceed to do the Work otherwise, or to abandon the Work, if in the judgment of the Agency or its agent(s), it is in the best interest of the State.

5.2.3 An increase or decrease in the quantity for any item is not sufficient grounds for an increase or decrease in the Unit Price.

5.2.4 The prices quoted are to be those for which the material will be furnished F.O.B. Job Site and include all charges that may be imposed during the period of the Contract.

5.2.5 No qualifying letter or statements in or attached to the Bid, or separate discounts will be considered in determining the low Bid except as may be otherwise herein noted. Cash or separate discounts should be computed and incorporated into Unit Bid Price(s).

5.3 DISQUALIFICATION OF BIDDERS

5.3.1 An agency shall determine that each Bidder on any Public Works Contract is responsible before awarding the Contract. Factors to be considered in determining the responsibility of a Bidder include:

A. The Bidder's financial, physical, personnel or other resources including Subcontracts;

B. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations of the Prevailing Wage Laws in Delaware or any other state;

C. The Bidder's written safety plan;

D. Whether the Bidder is qualified legally to contract with the State;

E. Whether the Bidder supplied all necessary information concerning its responsibility; and,

F. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that the criteria be set forth in the Invitation to Bid and is otherwise in conformity with State and/or Federal law.

5.3.2 If an agency determines that a Bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis for the determination. A copy of the determination shall be sent to the affected Bidder within five (5) working days of said determination.

5.3.3 In addition, any one or more of the following causes may be considered as sufficient for the disqualification of a Bidder and the rejection of their Bid or Bids.

5.3.3.1 More than one Bid for the same Contract from an individual, firm or corporation under the same or different names.

5.3.3.2 Evidence of collusion among Bidders.

5.3.3.3 Unsatisfactory performance record as evidenced by past experience.

5.3.3.4 If the Unit Prices are obviously unbalanced either in excess or below reasonable cost analysis values.

5.3.3.5 If there are any unauthorized additions, interlineation, conditional or alternate bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite or ambiguous as to its meaning.
5.3.3.6 If the Bid is not accompanied by the required Bid Security and other data required by the Bidding Documents.

5.3.3.7 If any exceptions or qualifications of the Bid are noted on the Bid Form.

5.4 ACCEPTANCE OF BID AND AWARD OF CONTRACT

5.4.1 A formal Contract shall be executed with the successful Bidder within twenty (20) calendar days after the award of the Contract.

5.4.2 Per Section 6962(d)(13) a., Title 29, Delaware Code, “The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid.”

5.4.3 Each Bid on any Public Works Contract must be deemed responsive by the Agency to be considered for award. A responsive Bid shall conform in all material respects to the requirements and criteria set forth in the Contract Documents and specifications.

5.4.4 The Agency shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid, plus accepted Alternates.

5.4.5 The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of one year after the date of substantial completion.

5.4.6 If the successful Bidder fails to execute the required Contract and Bond, as aforesaid, within twenty (20) calendar days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.

5.4.7 Each bidder shall supply with its bid its taxpayer identification number (i.e., federal employer identification number or social security number) and a copy of its Delaware business license, and should the vendor be awarded a contract, such vendor shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.4.8 The Bid Security shall be returned to the successful Bidder upon the execution of the formal contract. The Bid Securities of unsuccessful bidders shall be returned within thirty (30) calendar days after the opening of the Bids.

ARTICLE 6: POST-BID INFORMATION

6.1 CONTRACTOR’S QUALIFICATION STATEMENT

6.1.1 Bidders to whom award of a Contract is under consideration shall, if requested by the Agency, submit a properly executed AIA Document A305, Contractor’s Qualification Statement, unless such a statement has been previously required and submitted.
6.2 BUSINESS DESIGNATION FORM

6.2.1 Successful bidder shall be required to accurately complete an Office of Management and Budget Business Designation Form for Subcontractors.

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

7.1.1 The cost of furnishing the required Bonds, that are stipulated in the Bidding Documents, shall be included in the Bid.

7.1.2 If the Bidder is required by the Agency to secure a bond from other than the Bidder’s usual sources, changes in cost will be adjusted as provided in the Contract Documents.

7.1.3 The Performance and Payment Bond forms used shall be the standard OMB forms (attached).

7.2 TIME OF DELIVERY AND FORM OF BONDS

7.2.1 The bonds shall be dated on or after the date of the Contract.

7.2.2 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a certified and current copy of the power of attorney.

ARTICLE 8: FORM OF AGREEMENT BETWEEN AGENCY AND CONTRACTOR

8.1 Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum.

ARTICLE 9: LIQUIDATED DAMAGES

9.1 Schedule of Liquidated Damages:

<table>
<thead>
<tr>
<th>Awarded Contract Value</th>
<th>Daily Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Greater Than</td>
<td>Up to and Including</td>
</tr>
<tr>
<td>$0.00</td>
<td>$25,000.00</td>
</tr>
<tr>
<td>$25,000.00</td>
<td>$50,000.00</td>
</tr>
<tr>
<td>$50,000.00</td>
<td>$100,000.00</td>
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<td>$100,000.00</td>
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<tr>
<td>$1,000,000.00</td>
<td>$2,000,000.00</td>
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<tr>
<td>$2,000,000.00</td>
<td>$5,000,000.00</td>
</tr>
<tr>
<td>$5,000,000.00</td>
<td>$10,000,000.00</td>
</tr>
<tr>
<td>$10,000,000.00</td>
<td>$15,000,000.00</td>
</tr>
</tbody>
</table>
9.2 For each calendar day or work day that work remains uncompleted after the Contract time has expired or beyond the completion date established by the Contract, the sum specified in paragraph 9.1 of this document, will be deducted from any money due the Contractor. This sum shall not be considered and treated as a penalty but as liquidated damages due the University by reason of inconvenience to the public, added cost of engineering and supervision, and other extra expenditures of public funds due to the Contractor’s failure to complete the work on time. Any adjustment of the Contract time for completion of the work granted by the University will be considered in the assessment of liquidated damages.

END OF SECTION 00 21 13
**BID FORM**

**Project:** PC-19-008 – Administration Building Sidewalk and Drainage Improvements

**Location:** Delaware State University
MAIN CAMPUS
1200 NORTH DUPONT HWY
DOVER, DELAWARE 19901

**For Bids Due:** 7/22/2020, 3:00 PM LOCAL TIME

**To:** SUBMIT ALL BID ELECTRONICLY TO CONSTRUCTIONBID@DESU.EDU BY THE DATE AND TIME LISTED ABOVE

**Name of Bidder:**

**Delaware Business License No.:** ________________ **Taxpayer ID No.:** ________________

*(A copy of Bidder’s Delaware Business License must be attached to this form.)*

**(Other License Nos.):** ________________

**Phone No.:** (            ) _______ - _______ **Fax No.:** (            ) _______ - _______

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_______________________________(Written Out).

($_____________________________) (Figures).

[This price includes all allowances as documented within the project manual.]

**A. ALTERNATES (Note: project is subject to prevailing wages)**

1. Alternates: Alternate prices conform to applicable project specification section. Refer to the drawing specifications for a complete description of the following Alternates. An “ADD” or “DEDUCT” amount is indicated by the crossing out the part that does not apply.

   a. **Alternate #1:** Net - ADD / DEDUCT

      • $_______________________________ (Figures).
      • _________________________________(Written Out).
b. **Alternate #2:**

   - Net - ADD / DEDUCT
   - ______________________________________________ (Figures).
   - ______________________________________________ (Written Out).

c. **Alternate #3:**

   - Net - ADD / DEDUCT
   - ______________________________________________ (Figures).
   - ______________________________________________ (Written Out).

**B. UNIT PRICES**

1. Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

<table>
<thead>
<tr>
<th>UNIT PRICE No. 1: (BRIEF DESCRIPTION)</th>
<th>ADD</th>
<th>DEDUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$___</td>
<td>$_____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT PRICE No. 2: (BRIEF DESCRIPTION)</th>
<th>ADD</th>
<th>DEDUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$___</td>
<td>$_____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT PRICE No. 3: (BRIEF DESCRIPTION)</th>
<th>ADD</th>
<th>DEDUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$___</td>
<td>$_____</td>
</tr>
</tbody>
</table>

**C. WORK SCHEDULE**

1. We understand that this contract is governed by liquidated damages and that submission of this bid is acceptance of the proposed contract completion date. Our proposed detailed project schedule shows more fully the sequence of activities necessary to meet the specified schedule. The project schedule is a required attachment of a complete bid and **failure to submit a viable schedule will be a justifiable reason to deem the bid as incomplete.** Bid schedule shall be submitted in Gantt Chart format (Microsoft Project preferred) to be deemed as an adequate project schedule.

   a. Schedule should be detailed by trade and show manpower, or provide narrative explaining planned crews.
   b. Include milestones, phasing, critical path, etc.
   c. Document any weather contingency built into schedule.

2. Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____ calendar days of the Notice to Proceed.

3. **Alternative Work Hours**

   Work during “regular hours” at this site is being performed on a single shift, eight hours per day, 7:30 AM to 4:30 PM, and five days per week, Monday through Friday. To meet the schedule established on the basis of Item 1 above, our proposed work hours will be _____ hours per day, _____ AM to _____ PM, and _____ days per week, ______ through ______ the cost of which is reflected in our lump sum price. Our lump sum price also includes any mandatory off-hours work required per special conditions.
D. SITE SUPERINTENDANT

We propose to use ______________________________ as our site superintendent. A resume of his/her qualifications is attached.

We understand that DSU reserves the right to interview him/her prior to contract award/prior to start of work and to reject him/her if not considered acceptable. If rejected, we will propose alternate personnel for the position who will be subject to the same review and acceptance procedure, at no increase in our lump sum proposal.

We also understand DSU reserves the right to reject our bid if we are unable to provide a site supervisor acceptable to DSU within thirty (30) calendar days after submission of this bid.

E. REMARKS

1. I/We acknowledge Addendums numbered____________ and the price(s) submitted include any cost/schedule impact they may have.

2. This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids (60 days for School Districts and Department of Education), and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

3. The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

4. This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

5. Our Bid Price(s) are firm based on contract award within thirty (30) calendar days of the date of submittal of this bid.

6. I/We understand that we will not be compensated at a later date for claimed additional costs based on any information received during the bid period, but which is not identified in our proposal and subsequently accepted in writing by DSU.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By __________________________ Trading as ______________________________
(Individual’s / General Partner’s / Corporate Name)
________________________
(State of Corporation)

Business Address: ______________________________________________________
________________________
________________________

Witness: __________________________ By: __________________________
(SEAL)
(Authorized Signature)
________________________
(Title)

Date: __________________________

ATTACHMENTS
Sub-Contractor List
Non-Collusion Statement
Bid Security
Construction Schedule
Resume of Site Superintendent
(Others as Required by Project Manuals)

END OF SECTION 00 41 13
KNOW ALL MEN BY THESE PRESENTS That:

____________________ of ____________________________ in the County of ____________________ and State of ____________________ as Principal, and

________________ of ____________________________ in the County of ____________________ and State of ____________________ as Surety, legally authorized to do business in the State of Delaware ("State"), are held and firmly unto the State in the sum of ____________________________ Dollars ($___________), or __________ percent not to exceed _______________ Dollars ($___________) of amount of bid on Contract No. ________________, to be paid to the State for the use and benefit of ____________________________ (insert State agency name) for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the ____________________________ (insert State agency name) a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the ____________________________ (insert State agency name) this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _______ seal and dated this ______ day of ________ in the year of our Lord two thousand and ____________ (20__) .

SEALED, AND DELIVERED IN THE
Presence of

________________________________________
Name of Bidder (Organization)

________________________________________
Authorized Signature

Corporate Seal

Attest _____________

Title

_____________________________________
Name of Surety

Witness: _____________ By: ________________________

Title
SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor **must be listed for each category** where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the **Owner**, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<table>
<thead>
<tr>
<th>Subcontractor Category</th>
<th>Subcontractor</th>
<th>Address (City &amp; State)</th>
<th>Subcontractor tax payer ID # or Delaware Business license #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
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<tr>
<td>Landscape</td>
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<tr>
<td>2.</td>
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<tr>
<td>Geotech Testing</td>
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<td>3.</td>
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<td>4.</td>
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<td>5.</td>
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<td>6.</td>
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<td>7.</td>
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<tr>
<td>8.</td>
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<tr>
<td>9.</td>
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<td></td>
</tr>
</tbody>
</table>
NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date (to the Office of Management and Budget, Division of Facilities Management).

All the terms and conditions of (Project or Contract Number) have been thoroughly examined and are understood.

NAME OF BIDDER: _________________________________

AUTHORIZED REPRESENTATIVE (TYPED): _________________________________

AUTHORIZED REPRESENTATIVE (SIGNATURE): _________________________________

TITLE: _________________________________

ADDRESS OF BIDDER: _________________________________

E-MAIL: _________________________________

PHONE NUMBER: _________________________________

Sworn to and Subscribed before me this ______________________ day of ______________ 20___.

My Commission expires ______________________. NOTARY PUBLIC _______________________

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.
AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: ____________________________________________

Contractor/Subcontractor Address: __________________________________________

__________________________________________

Authorized Representative (typed or printed): ________________________________

Authorized Representative (signature): _________________________________

Title: _________________________________

Sworn to and Subscribed before me this ____________________________ day of _______ 20____

My Commission expires ___________________________ NOTARY PUBLIC ____________________________

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.
STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR A101-2007

The contract to be utilized on this project shall be the “Standard Form of Agreement Between Owner and Contractor” AIA Document A101-2007.

END OF SECTION 00 52 13
SUPPLEMENT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR A101-2007

The following supplements modify the “Standard Form of Agreement Between Owner and Contractor,” AIA Document A101-2007. Where a portion of the Standard Form of Agreement is modified or deleted by the following, the unaltered portions of the Standard Form of Agreement shall remain in effect.

ARTICLE 5: PAYMENTS

5.1 PROGRESS PAYMENTS

5.1.3 Delete paragraph 5.1.3 in its entirety and replace with the following:

"Provided that a valid Application for Payment is received by the Architect that meets all requirements of the Contract, payment shall be made by the Owner not later than 30 days after the Owner receives the valid Application for Payment."

ARTICLE 8: MISCELLANEOUS PROVISIONS

8.2 Insert the following:

"Payments are due 30 days after receipt of a valid Application for Payment. After that 30 day period, interest may be charged at the rate of 1% per month not to exceed 12% per annum."

8.5 Delete paragraph 8.5 in its entirety and replace with the following:

"The Contractor's representative shall not be changed without ten days written notice to the Owner."

END OF SECTION 00 54 13
STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

PERFORMANCE BOND

Bond Number: ___________________

KNOW ALL PERSONS BY THESE PRESENTS, that we, ______________________, as principal (“Principal”), and ______________________, a __________________________________ corporation, legally authorized to do business in the State of Delaware, as surety (“Surety”), are held and firmly bound unto the ____________________________________________ (“Owner”) (insert State agency name), in the amount of ______________________ ($___________), to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole, firmly by these presents.

Sealed with our seals and dated this __________ day of ____________, 20__.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. ___________ dated the __________ day of ____________, 20__ (the “Contract”), which Contract is incorporated herein by reference, shall well and truly provide and furnish all materials, appliances and tools and perform all the work required under and pursuant to the terms and conditions of the Contract and the Contract Documents (as defined in the Contract) or any changes or modifications thereto made as therein provided, shall make good and reimburse Owner sufficient funds to pay the costs of completing the Contract that Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, hereby stipulates and agrees, if requested to do so by Owner, to fully perform and complete the work to be performed under the Contract pursuant to the terms, conditions and covenants thereof, if for any cause Principal fails or neglects to so fully perform and complete such work.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.
Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: ________________________________

Witness or Attest:  Address: ________________________________

________________________  By: ________________________________ (SEAL)
 Name: ________________________________
 Name: ________________________________
 Title: ________________________________

(Corporate Seal)

SURETY

Name: ________________________________

Witness or Attest:  Address: ________________________________

________________________  By: ________________________________ (SEAL)
 Name: ________________________________
 Name: ________________________________
 Title: ________________________________

(Corporate Seal)
KNOW ALL PERSONS BY THESE PRESENTS, that we, ____________________, as principal
(“Principal”), and ____________________, a ____________________ corporation, legally
authorized to do business in the State of Delaware, as surety (“Surety”), are held and firmly bound
unto the ______________________________________________ (“Owner”) (insert State agency
name), in the amount of ___________________ ($___________), to be paid to Owner, for which
payment well and truly to be made, we do bind ourselves, our and each and every of our heirs,
executors, administrations, successors and assigns, jointly and severally, for and in the whole firmly
by these presents.

Sealed with our seals and dated this _____________ day of____________, 20__. 

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been
awarded by Owner that certain contract known as Contract No. ____________ dated the _______
day of ____________, 20__ (the “Contract”), which Contract is incorporated herein by reference,
shall well and truly pay all and every person furnishing materials or performing labor or service in
and about the performance of the work under the Contract, all and every sums of money due him,
her, them or any of them, for all such materials, labor and service for which Principal is liable,
shall make good and reimburse Owner sufficient funds to pay such costs in the completion of the
Contract as Owner may sustain by reason of any failure or default on the part of Principal, and
shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of
or by reason of the performance of the Contract and for as long as provided by the Contract; then
this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that
the obligation of Surety and its bond shall be in no way impaired or affected by any extension of
time, modification, omission, addition or change in or to the Contract or the work to be performed
thereunder, or by any payment thereunder before the time required therein, or by any waiver of any
provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be
performed or any monies due or to become due thereunder; and Surety hereby waives notice of any
and all such extensions, modifications, omissions, additions, changes, payments, waivers,
assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all
things done and omitted to be done by and in relation to assignees, subcontractors, and other
transferees shall have the same effect as to Surety as though done or omitted to be done by or in
relation to Principal.

Surety hereby stipulates and agrees that no modifications, omission or additions in or to the terms
of the Contract shall in any way whatsoever affect the obligation of Surety and its bond.
Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: ________________________________

Witness or Attest: Address: ________________________________

By: ________________________________ (SEAL)

Name: ________________________________
Tele: ________________________________

(Corporate Seal)

SURETY

Name: ________________________________

Witness or Attest: Address: ________________________________

By: ________________________________ (SEAL)

Name: ________________________________
Tele: ________________________________

(Corporate Seal)
APPLICATION AND CERTIFICATION FOR PAYMENT

TO OWNER: PROJECT: New Office & Warehouse

Owner:
0000 4th Street
Las Vegas, NV 00000

FROM CONTRACTOR: VIA ARCHITECT:
XYZ ELECTRIC
000 Las Vegas BLVD.
Las Vegas, NV 00000

CONTRACT FOR: Elect. Systems VIA GENERAL CONTRACTOR: Burke & Associates

APPLICATION NO: DISTRIBUTION TO:
4 OWNER

CONTRACT NO. PC-19-008 PERIOD TO: 12/31/99

PROJECT NOS: NV000 CONTRACT DATE: 08/13/99

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.

Continuation Sheet, AIA Document G703, is attached.

| 1. ORIGINAL CONTRACT SUM          | $ 120,693.00 |
| 2. Net change by Change Orders   | $ 832.16    |
| 3. CONTRACT SUM TO DATE (Line 1 + 2) | $ 121,525.16 |
| 4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) | $ 53,064.30 |
| 5. RETAINAGE:                     |
|   a. % of Completed Work (Column D + E on G703) | $ 5,069.73 |
|   b. % of Stored Material (Column F on G703) | $ 236.70 |
| Total Retainage (Lines 5a + 5b or Total in Column 1 of G703) | $ 5,306.43 |
| 6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total) | $ 47,757.87 |
| 7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate) | $ 21,970.80 |
| 8. CURRENT PAYMENT DUE            | $ 25,787.07 |
| 9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6) | $ 73,767.29 |

<table>
<thead>
<tr>
<th>CHANGE ORDER SUMMARY</th>
<th>ADDITIONS</th>
<th>DEDUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total changes approved in previous months by Owner</td>
<td>$0.00</td>
<td></td>
</tr>
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<tr>
<td>NET CHANGES by Change Order</td>
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</table>

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR: XYZ ELECTRIC

By: ___________________________ Date: 12/31/99

President State of: County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATION FOR PAYMENT

In accordance with the Contract Documents, the undersigned Architec...

AMOUNT CERTIFIED: $5069.73

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: ___________________________ Date: ___________________________

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION OF WORK</th>
<th>SCHEDULED VALUE</th>
<th>WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)</th>
<th>WORK COMPLETED THIS PERIOD</th>
<th>MATERIALS PRESENTLY STORED (NOT IN D OR E)</th>
<th>TOTAL COMPLETED AND STORED TO DATE (D+E+F)</th>
<th>% (G - C)</th>
<th>BALANCE TO FINISH (C - G)</th>
<th>RETAINAGE (IF VARIABLE RATE)</th>
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Users may obtain validation of this document by requesting of the license a completed AIA Document D401 - Certification of Document's Authenticity.
The General Conditions of this Contract are as stated in the American Institute of Architects Document AIA A201 (2007 Edition) entitled General Conditions of the Contract for Construction and is part of this project manual as if herein written in full.

END OF SECTION 007213
SUPPLEMENTARY GENERAL CONDITIONS A201-2007

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201-2007. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

TABLE OF ARTICLES

1. GENERAL PROVISIONS
2. OWNER
3. CONTRACTOR
4. ADMINISTRATION OF THE CONTRACT
5. SUBCONTRACTORS
6. CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7. CHANGES IN THE WORK
8. TIME
9. PAYMENTS AND COMPLETION
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13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT
ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

“The Contract Documents also include Advertisement for Bid, Instructions to Bidder, sample forms, the Bid Form, the Contractor’s completed Bid and the Award Letter.”

Add the following Paragraph:

1.1.1.1 In the event of conflict or discrepancies among the Contract Documents, the Documents prepared by the State of Delaware, Division of Facilities Management shall take precedence over all other documents.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect’s interpretation.

1.2.5 The word “PROVIDE” as used in the Contract Documents shall mean “FURNISH AND INSTALL” and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word “PRODUCT” as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete Paragraph 1.5.1 in its entirety and replace with the following:

“All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. Such documents may be used by the Owner to construct one or more like Projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors and Material or Equipment Suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect’s consultants appropriate to and for use in the execution of their Work under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect’s consultants.

The Architect shall not be liable for injury or damage resulting from the re-use of drawings and specifications if the Architect is not involved in the re-use Project. Prior to re-use of construction documents for a Project in which the Architect is not also involved, the Owner will remove from such documents all identification of the original Architect, including name, address and professional seal or stamp.”

Delete Paragraph 1.5.2 in its entirety.
ARTICLE 2: OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

To Subparagraph 2.2.3 – Add the following sentence:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

Delete Subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor shall be furnished free of charge up to five (5) sets of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Amend Paragraph 3.2.2 to state that any errors, inconsistencies or omissions discovered shall be reported to the Architect and Owner immediately.

Delete the third sentence in Paragraph 3.2.3.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Paragraphs:

3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be so disorderly, or who for any reason is not satisfactory to the Owner, and that person shall not again be employed on the Work without the consent of the Owner or the Architect.

3.3.4 The Contractor must provide suitable storage facilities at the Site for the proper protection and safe storage of their materials. Consult the Owner and the Architect before storing any materials.

3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or clearing arising from such use.

3.4 LABOR AND MATERIALS

Add the Following Paragraphs:

3.4.4 Before starting the Work, each Contractor shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.
3.4.5 Under no circumstances shall the Contractor’s Work proceed prior to preparatory Work proceeding prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

3.5 WARRANTY

Add the following Paragraphs:

3.5.1 The Contractor will guarantee all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two years after Acceptance by the Owner, and will maintain all items in perfect condition during the period of guarantee.

3.5.2 Defects appearing during the period of guarantee will be made good by the Contractor at his expense upon demand of the Owner, it being required that all work will be in perfect condition when the period of guarantee will have elapsed.

3.5.3 In addition to the General Guarantee there are other guarantees required for certain items for different periods of time than the two years as above, and are particularly so stated in that part of the specifications referring to same. The said guarantees will commence at the same time as the General Guarantee.

3.5.4 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the Contractor’s expense.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following Paragraphs:

3.11.1 During the course of the Work, the Contractor shall maintain a record set of drawings on which the Contractor shall mark the actual physical location of all piping, valves, equipment, conduit, outlets, access panels, controls, actuators, including all appurtenances that will be concealed once construction is complete, etc., including all invert elevations.

3.11.2 At the completion of the project, the Contractor shall obtain a set of reproducible drawings from the Architect, and neatly transfer all information outlined in 3.11.1 to provide a complete record of the as-built conditions.

3.11.3 The Contractor shall provide two (2) prints of the as-built conditions, along with the reproducible drawings themselves, to the Owner and one (1) set to the Architect. In addition, attach one complete set to each of the Operating and Maintenance Instructions/Manuals.

3.17 In the second sentence of the paragraph, insert “indemnify” between “shall” and “hold”.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.2 ADMINISTRATION OF THE CONTRACT

Delete the first sentence of Paragraph 4.2.7 and replace with the following:
The Architect will review and approve or take other appropriate action upon the Contractor’s submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Delete the second sentence of Paragraph 4.2.7 and replace with the following:

The Architect’s action will be taken with such reasonable promptness as to cause no delay in the Work in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Owner’s professional judgment to permit adequate review.

Add the following Paragraph:

4.2.10.1 There will be no full-time project representative provided by the Owner or Architect on this project.

Add to Paragraph 4.2.13 “and in compliance with all local requirements.” to the end of the sentence

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Paragraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER’S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

Delete Paragraph 6.1.4 in its entirety.

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the second sentence, strike the word “shall” and insert the word “may”.

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following Paragraphs:

8.2.1.1 Refer to Specification Section SUMMARY OF WORK for Contract time requirements.

8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to bring the Work into compliance with the Progress Schedule at no additional cost to the Owner.

8.3 DELAYS AND EXTENSION OF TIME
8.3.1 Strike "arbitration" and insert "remedies at law or in equity".

Add the following Paragraph:

8.3.2.1 The Contractor shall update the status of the suspension, delay, or interruption of the Work with each Application for Payment. (The Contractor shall report the termination of such cause immediately upon the termination thereof.) Failure to comply with this procedure shall constitute a waiver for any claim for adjustment of time or price based upon said cause.

Delete Paragraph 8.3.3 in its entirety and replace with the following:

8.3.3 Except in the case of a suspension of the Work directed by the Owner, an extension of time under the provisions of Paragraph 8.3.1 shall be the Contractor's sole remedy in the progress of the Work and there shall be no payment or compensation to the Contractor for any expense or damage resulting from the delay.

Add the following Paragraph:

8.3.4 By permitting the Contractor to work after the expired time for completion of the project, the Owner does not waive their rights under the Contract.

ARTICLE 9: PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following Paragraphs:

9.2.1 The Schedule of Values shall be submitted using AIA Document G702, Continuation Sheet to G703.

9.2.2 The Schedule of Values is to include a line item for Project Closeout Document Submittal. The value of this item is to be no less than 1% of the initial contract amount.

9.3 APPLICATIONS FOR PAYMENT

Add the following Paragraph:

9.3.1.3 Application for Payment shall be submitted on AIA Document G702 "Application and Certificate for Payment", supported by AIA Document G703 "Continuation Sheet". Said Applications shall be fully executed and notarized.

Add the following Paragraphs:

9.3.4 Until Closeout Documents have been received and outstanding items completed the Owner will pay 95% (ninety-five percent) of the amount due the Contractor on account of progress payments.

9.3.5 The Contractor shall provide a current and updated Progress Schedule to the Architect with each Application for Payment. Failure to provide Schedule will be just cause for rejection of Application for Payment.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to 9.5.1:
.8 failure to provide a current Progress Schedule;
.9 a lien or attachment is filed;
.10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS
Delete Paragraph 9.6.1 in its entirety and replace with the following:

9.6.1 After the Architect has approved and issued a Certificate for Payment, payment shall be made by the Owner within 30 days after Owner’s receipt of the Certificate for Payment.

9.7 FAILURE OF PAYMENT
In first sentence, strike “seven” and insert “thirty (30)”. Also strike “binding dispute resolution” and insert “remedies at law or in equity”.

9.8 SUBSTANTIAL COMPLETION
To Subparagraph 9.8.3 - Add the following sentence:

“If the Architect is required to make more than 2 inspections of the same portion of work, the Contractor shall be responsible for all costs associated with subsequent inspections including but not limited to any Architect’s fees.”

9.8.5 In the second sentence, strike “shall” and insert “may”.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS
Add the following Paragraphs:

10.1.1.1 Each Contractor shall develop a safety program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor’s Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety Representatives shall be someone who is on site on a full time basis. If deemed necessary by the Owner or Architect, Contractor Safety meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

10.2 SAFETY OF PERSONS AND PROPERTY
Add the following Paragraph:

10.2.4.1 As required in the Hazardous Chemical Act of June 1984, all vendors supplying any material that may be defined as hazardous must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a caution warning on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in foreseeable emergency situations. Material Safety Data Sheets shall be provided directly to the Owner, along with the shipping slips that include those products.

10.3 HAZARDOUS MATERIALS
Delete Paragraph 10.3.3 in its entirety.

Delete Paragraph 10.3.6 in its entirety.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR’S LIABILITY INSURANCE

11.1.4 Strike “the Owner” immediately following “(1)” and strike “and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor’s negligent acts or omissions during the Contractor’s completed operations.”

11.2 OWNER’S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Paragraph 11.3 in its entirety and replace with the following:

11.3 The State will not provide Builder’s All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide property coverage for their tools and equipment, as necessary. Any mandatory deductible required by the Contractor’s Insurance shall be the responsibility of the Contractor.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 Add the following sentence: “The bonds will conform to those forms approved by the Office of Management and Budget.”

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

Add the following Paragraph:

12.2.2.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.1 Strike “one” and insert “two”.

12.2.2 Strike “one” and insert “two”.

12.2.3 Strike “one” and insert “two”.

12.2.5 In second sentence, strike “one” and insert “two”.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW
Strike “except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.”

13.6 INTEREST

Strike “the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.” Insert “30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.

13.7 TIME LIMITS ON CLAIMS

Strike the last sentence.

Add the following Paragraph:

13.8 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.8.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.

Add the following Paragraph:

13.9 CLOUD-BASED PROJECT MANAGEMENT SYSTEM

13.9.1 The Contractor is responsible for communicating to the Owner and the Architect using the University’s Cloud-Based Project Management System for the duration of the contract. The Owner will administer the site and shall provide login credentials to the Contractor following contract award.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete Paragraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner’s convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

ARTICLE 15: CLAIMS AND DISPUTES

15.1.2 Throughout the Paragraph strike “21” and insert “45”.

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.6 in its entirety.

15.2 INITIAL DECISION

Delete Paragraph 15.2.5 in its entirety and replace with the following:

15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and shall notify the parties of any change in the Contract Sum or
Contract Time or both. The approval or rejection of a Claim by the Architect shall be subject to mediation and other remedies at law or in equity.

Delete Paragraph 15.2.6 and its subparagraphs in their entirety.

15.3 MEDIATION

15.3.1 Strike "binding dispute resolution" and insert "any or all remedies at law or in equity".

15.3.2 In the first sentence, delete "administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedure in effect on the date of the Agreement," Strike "binding dispute resolution" and insert "remedies at law and in equity".

15.4 ARBITRATION

Delete Paragraph 15.4 and its sub-sections in its entirety.

END OF SECTION 00 73 13
GENERAL REQUIREMENTS

TABLE OF ARTICLES

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12. UNCOVERING AND CORRECTION OF WORK
13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT
ARTICLE 1: GENERAL

1.1 CONTRACT DOCUMENTS

1.1.1 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 to an extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.1.2 Work including material purchases shall not begin until the Contractor is in receipt of a bonafide State of Delaware Purchase Order. Any work performed or material purchases prior to the issuance of the Purchase Order is done at the Contractor's own risk and cost.

1.2 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

1.2.1 For Public Works Projects financed in whole or in part by state appropriation the Contractor agrees that during the performance of this contract:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take positive steps to ensure that applicants are employed and that employees are treated during employment without regard to their race, creed, sex, color, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, sex, color, sexual orientation, gender identity or national origin."

ARTICLE 2: OWNER

(NO ADDITIONAL GENERAL REQUIREMENTS – SEE SUPPLEMENTARY GENERAL CONDITIONS)

ARTICLE 3: CONTRACTOR

3.1 Schedule of Values: The successful Bidder shall within twenty (20) days after receiving notice to proceed with the work, furnish to the Owner a complete schedule of values on the various items comprising the work.

3.2 Subcontracts: Upon approval of Subcontractors, the Contractor shall award their Subcontracts as soon as possible after the signing of their own contract and see that all material, their own and those of their Subcontractors, are promptly ordered so that the work will not be delayed by failure of materials to arrive on time.

3.3 Before commencing any work or construction, the General Contractor is to consult with the Owner as to matters in connection with access to the site and the allocation of Ground Areas for the various features of hauling, storage, etc.
3.4 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions.

3.5 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.6 The Contractor warrants to the Owner that materials and equipment furnished will be new and of good quality, unless otherwise permitted, and that the work will be free from defects and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved, may be considered defective. If required by the Owner, the Contractor shall furnish evidence as to the kind and quality of materials and equipment provided.

3.7 Unless otherwise provided, the Contractor shall pay all sales, consumer, use and other similar taxes, and shall secure and pay for required permits, fees, licenses, and inspections necessary for proper execution of the Work.

3.8 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work. The Contractor shall promptly notify the Owner if the Drawings and Specifications are observed to be at variance therewith.

3.9 The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under contract with the Contractor.

3.10 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project all waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. The Contractor shall be responsible for returning all damaged areas to their original conditions.

3.11 STATE LICENSE AND TAX REQUIREMENTS

3.11.1 Each Contractor and Subcontractor shall be licensed to do business in the State of Delaware and shall pay all fees and taxes due under State laws. In conformance with Section 2503, Chapter 25, Title 30, Delaware Code, "the Contractor shall furnish the Delaware Department of Finance within ten (10) days after entering into any contract with a contractor or subcontractor not a resident of this State, a statement of total value of such contract or contracts together with the names and addresses of the contracting parties."

3.12 The Contractor shall comply with all requirements set forth in Section 6962, Chapter 69, Title 29 of the Delaware Code.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.1 CONTRACT SURETY

4.1.1 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

4.1.2 All bonds will be required as follows unless specifically waived elsewhere in the Bidding Documents.

4.1.3 Contents of Performance Bonds – The bond shall be in the form approved by the Office of Management and Budget. The bond shall be conditioned upon the faithful compliance and performance by the successful bidder of each and every term and condition of the contract and the
proposal, plans, specifications, and bid documents thereof. Each term and condition shall be met at the time and in the manner prescribed by the Contract, Bid documents and the specifications, including the payment in full to every person furnishing materiel or performing labor in the performance of the Contract, of all sums of money due the person for such labor and materiel. (The bond shall also contain the successful bidder’s guarantee to indemnify and save harmless the State and the agency from all costs, damages and expenses growing out of or by reason of the Contract in accordance with the Contract.)

4.1.4 Invoking a Performance Bond – The agency may, when it considers that the interest of the State so require, cause judgement to be confessed upon the bond.

4.1.5 Within twenty (20) days after the date of notice of award of contract, the Bidder to whom the award is made shall furnish a Performance Bond and Labor and Material Payment Bond, each equal to the full amount of the Contract price to guarantee the faithful performance of all terms, covenants and conditions of the same. The bonds are to be issued by an acceptable Bonding Company licensed to do business in the State of Delaware and shall be issued in duplicate.

4.1.6 Performance and Payment Bonds shall be maintained in full force (warranty bond) for a period of two (2) years after the date of the Certificate for Final Payment. The Performance Bond shall guarantee the satisfactory completion of the Project and that the Contractor will make good any faults or defects in his work which may develop during the period of said guarantees as a result of improper or defective workmanship, material or apparatus, whether furnished by themselves or their Sub-Contractors. The Payment Bond shall guarantee that the Contractor shall pay in full all persons, firms or corporations who furnish labor or material or both labor and material for, or on account of, the work included herein. The bonds shall be paid for by this Contractor. The Owner shall have the right to demand that the proof parties signing the bonds are duly authorized to do so.

4.2 FAILURE TO COMPLY WITH CONTRACT

4.2.1 If any firm entering into a contract with the State, or Agency that neglects or refuses to perform or fails to comply with the terms thereof, the Agency which signed the Contract may terminate the Contract and proceed to award a new contract in accordance with this Chapter 69, Title 29 of the Delaware Code or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond. Nothing herein shall preclude the Agency from pursuing additional remedies as otherwise provided by law.

4.3 CONTRACT INSURANCE AND CONTRACT LIABILITY

4.3.1 In addition to the bond requirements stated in the Bid Documents, each successful Bidder shall purchase adequate insurance for the performance of the Contract and, by submission of a Bid, agrees to indemnify and save harmless and to defend all legal or equitable actions brought against the State, any Agency, officer and/or employee of the State, for and from all claims of liability which is or may be the result of the successful Bidder’s actions during the performance of the Contract.

4.3.2 The purchase or nonpurchase of such insurance or the involvement of the successful Bidder in any legal or equitable defense of any action brought against the successful Bidder based upon work performed pursuant to the Contract will not waive any defense which the State, its agencies and their respective officers, employees and agents might otherwise have against such claims, specifically including the defense of sovereign immunity, where applicable, and by the terms of this section, the State and all agencies, officers and employees thereof shall not be financially responsible for the consequences of work performed, pursuant to said contract.

4.4 RIGHT TO AUDIT RECORDS
4.4.1 The Owner shall have the right to audit the books and records of a Contractor or any Subcontractor under any Contract or Subcontract to the extent that the books and records relate to the performance of the Contract or Subcontract.

4.4.2 Said books and records shall be maintained by the Contractor for a period of seven (7) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of seven (7) years from the date of final payment under the Subcontract.

ARTICLE 5: SUBCONTRACTORS

5.1 SUBCONTRACTING REQUIREMENTS

5.1.1 All contracts for the construction, reconstruction, alteration or repair of any public building (not a road, street or highway) shall be subject to the following provisions:

1. A contract shall be awarded only to a Bidder whose Bid is accompanied by a statement containing, for each Subcontractor category, the name and address (city or town and State only – street number and P.O. Box addresses not required) of the subcontractor whose services the Bidder intends to use in performing the Work and providing the material for such Subcontractor category.

2. A Bid will not be accepted nor will an award of any Contract be made to any Bidder which, as the Prime Contractor, has listed itself as the Subcontractor for any Subcontractor unless:

   A. It has been established to the satisfaction of the awarding Agency that the Bidder has customarily performed the specialty work of such Subcontractor category by artisans regularly employed by the Bidder’s firm;

   B. That the Bidder is duly licensed by the State to engage in such specialty work, if the State requires licenses; and

   C. That the Bidder is recognized in the industry as a bona fide Subcontractor or Contractor in such specialty work and Subcontractor category.

5.1.2 The decision of the awarding Agency as to whether a Bidder who list itself as the Subcontractor for a Subcontractor category shall be final and binding upon all Bidders, and no action of any nature shall lie against any awarding agency or its employees or officers because of its decision in this regard.

5.1.3 After such a Contract has been awarded, the successful Bidder shall not substitute another Subcontractor for any Subcontractor whose name was set forth in the statement which accompanied the Bid without the written consent of the awarding Agency.

5.1.4 No Agency shall consent to any substitution of Subcontractors unless the Agency is satisfied that the Subcontractor whose name is on the Bidders accompanying statement:

   A. Is unqualified to perform the work required;

   B. Has failed to execute a timely reasonable Subcontract;

   C. Has defaulted in the performance on the portion of the work covered by the Subcontract; or

   D. Is no longer engaged in such business.
5.1.5 Should a Bidder be awarded a contract, such successful Bidder shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.2 PENALTY FOR SUBSTITUTION OF SUBCONTRACTORS

5.2.1 Should the Contractor fail to utilize any or all of the Subcontractors in the Contractor’s Bid statement in the performance of the Work on the public bidding, the Contractor shall be penalized in the amount of (project specific amount*). The Agency may determine to deduct payments of the penalty from the Contractor or have the amount paid directly to the Agency. Any penalty amount assessed against the Contractor may be remitted or refunded, in whole or in part, by the Agency awarding the Contract, only if it is established to the satisfaction of the Agency that the Subcontractor in question has defaulted or is no longer engaged in such business. No claim for the remission or refund of any penalty shall be granted unless an application is filed within one year after the liability of the successful Bidder accrues. All penalty amounts assessed and not refunded or remitted to the contractor shall be reverted to the State.

*one (1) percent of contract amount not to exceed $10,000

5.3 ASBESTOS ABATEMENT

5.3.1 The selection of any Contractor to perform asbestos abatement for State-funded projects shall be approved by the Office of Management and Budget, Division of Facilities Management pursuant to Chapter 78 of Title 16.

5.4 STANDARDS OF CONSTRUCTION FOR THE PROTECTION OF THE PHYSICALLY HANDICAPPED

5.4.1 All Contracts shall conform with the standard established by the Delaware Architectural Accessibility Board unless otherwise exempted by the Board.

5.5 CONTRACT PERFORMANCE

5.5.1 Any firm entering into a Public Works Contract that neglects or refuses to perform or fails to comply with its terms, the Agency may terminate the Contract and proceed to award a new Contract or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond.

ARTICLE 6: CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

6.1 The Owner reserves the right to simultaneously perform other construction or operations related to the Project with the Owner’s own forces, and to award separate contracts in connection with other portions of the Project or other Projects at the same site.

6.2 The Contractor shall afford the Owner and other Contractors reasonable opportunity for access and storage of materials and equipment, and for the performance of their activities, and shall connect and coordinate their activities with other forces as required by the Contract Documents.

ARTICLE 7: CHANGES IN THE WORK
7.1 The Owner, without invalidating the Contract, may order changes in the Work consisting of Additions, Deletions, Modifications or Substitutions, with the Contract Sum and Contract completion date being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Professional, as the duly authorized agent, the Contractor and the Owner.

7.2 The Contract Sum and Contract Completion Date shall be adjusted only by a fully executed Change Order.

7.3 The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor and the Architect. In all cases, this cost or credit shall be based on the 'DPE' wages required and the "invoice price" of the materials/equipment needed.

7.3.1 “DPE” shall be defined to mean “direct personnel expense”. Direct payroll expense includes direct salary plus customary fringe benefits (prevailing wage rates) and documented statutory costs such as workman’s compensation insurance, Social Security/Medicare, and unemployment insurance (a maximum multiplier of 1.35 times DPE).

7.3.2 "Invoice price" of materials/equipment shall be defined to mean the actual cost of materials and/or equipment that is paid by the Contractor, (or subcontractor), to a material distributor, direct factory vendor, store, material provider, or equipment leasing entity. Rates for equipment that is leased and/or owned by the Contractor or subcontractor(s) shall not exceed those listed in the latest version of the "Means Building Construction Cost Data" publication.

7.3.3 In addition to the above, the General Contractor is allowed a fifteen percent (15%) markup for overhead and profit for additional work performed by the General Contractor's own forces. For additional subcontractor work, the Subcontractor is allowed a fifteen (15) percent overhead and profit on change order work above and beyond the direct costs stated previously. To this amount, the General Contractor will be allowed a mark-up not exceeding seven and one half percent (7.5%) on the subcontractors work. These mark-ups shall include all costs including, but not limited to: overhead, profit, bonds, insurance, supervision, etc. No markup is permitted on the work of the subcontractors subcontractor. No additional costs shall be allowed for changes related to the Contractor’s onsite superintendent/staff, or project manager, unless a change in the work changes the project duration and is identified by the CPM schedule. There will be no other costs associated with the change order.

ARTICLE 8: TIME

8.1 Time limits, if any, are as stated in the Project Manual. By executing the Agreement, the Contractor confirms that the stipulated limits are reasonable, and that the Work will be completed within the anticipated time frame.

8.2 If progress of the Work is delayed at any time by changes ordered by the Owner, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions, unavoidable casualties or other causes beyond the Contractor’s control, the Contract Time shall be extended for such reasonable time as the Owner may determine.

8.3 Any extension of time beyond the date fixed for completion of the construction and acceptance of any part of the Work called for by the Contract, or the occupancy of the building by the Owner, in whole or in part, previous to the completion shall not be deemed a waiver by the Owner of his right to annul or terminate the Contract for abandonment or delay in the matter provided for, nor relieve the Contractor of full responsibility.

8.4 SUSPENSION AND DEBARMENT

8.4.1 Per Section 6962(d)(14), Title 29, Delaware Code, “Any Contractor who fails to perform a public works contract or complete a public works project within the time schedule established by the Agency in the
Invitation To Bid, may be subject to Suspension or Debarment for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the Project.”

8.4.2 “Upon such failure for any of the above stated reasons, the Agency that contracted for the public works project may petition the Director of the Office of Management and Budget for Suspension or Debarment of the Contractor. The Agency shall send a copy of the petition to the Contractor within three (3) working days of filing with the Director. If the Director concludes that the petition has merit, the Director shall schedule and hold a hearing to determine whether to suspend the Contractor, debar the Contractor or deny the petition. The Agency shall have the burden of proving, by a preponderance of the evidence, that the Contractor failed to perform or complete the public works project within the time schedule established by the Agency and failed to do so for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the project. Upon a finding in favor of the Agency, the Director may suspend a Contractor from Bidding on any project funded, in whole or in part, with public funds for up to 1 year for a first offense, up to 3 years for a second offense and permanently debar the Contractor for a third offense. The Director shall issue a written decision and shall send a copy to the Contractor and the Agency. Such decision may be appealed to the Superior Court within thirty (30) days for a review on the record.”

8.5 RETAINAGE

8.5.1 Per Section 6962(d)(5) a.3, Title 29, Delaware Code: The Agency may at the beginning of each public works project establish a time schedule for the completion of the project. If the project is delayed beyond the completion date due to the Contractor's failure to meet their responsibilities, the Agency may forfeit, at its discretion, all or part of the Contractor's retainage.

8.5.2 This forfeiture of retainage also applies to the timely completion of the punchlist. A punchlist will only be prepared upon the mutual agreement of the Owner, Architect and Contractor. Once the punchlist is prepared, all three parties will by mutual agreement, establish a schedule for its completion. Should completion of the punchlist be delayed beyond the established date due to the Contractor’s failure to meet their responsibilities, the Agency may hold permanently, at its discretion, all or part of the Contractor’s retainage.

ARTICLE 9: PAYMENTS AND COMPLETION

9.1 APPLICATION FOR PAYMENT

9.1.1 Applications for payment shall be made upon AIA Document G702. There will be a five percent (5%) retainage on all Contractor's monthly invoices until completion of the project. This retainage may become payable upon receipt of all required closeout documentation, provided all other requirements of the Contract Documents have been met.

9.1.2 A date will be fixed for the taking of the monthly account of work done. Upon receipt of Contractor's itemized application for payment, such application will be audited, modified, if found necessary, and approved for the amount. Statement shall be submitted to the Owner.

9.1.3 Section 6516, Title 29 of the Delaware Code annualized interest is not to exceed 12% per annum beginning thirty (30) days after the “presentment” (as opposed to the date) of the invoice.

9.2 PARTIAL PAYMENTS

9.2.1 Any public works Contract executed by any Agency may provide for partial payments at the option of the Owner with respect to materials placed along or upon the sites or stored at secured locations, which are suitable for use in the performance of the contract.
9.2.2 When approved by the agency, partial payment may include the values of tested and acceptable materials of a nonperishable or noncontaminative nature which have been produced or furnished for incorporation as a permanent part of the work yet to be completed, provided acceptable provisions have been made for storage.

9.2.2.1 Any allowance made for materials on hand will not exceed the delivered cost of the materials as verified by invoices furnished by the Contractor, nor will it exceed the contract bid price for the material complete in place.

9.2.3 If requested by the Agency, receipted bills from all Contractors, Subcontractors, and material, men, etc., for the previous payment must accompany each application for payment. Following such a request, no payment will be made until these receipted bills have been received by the Owner.

9.3 SUBSTANTIAL COMPLETION

9.3.1 When the building has been made suitable for occupancy, but still requires small items of miscellaneous work, the Owner will determine the date when the project has been substantially completed.

9.3.2 If, after the Work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and without terminating the Contract, the Owner may make payment of the balance due for the portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment that it shall not constitute a waiver of claims.

9.3.3 On projects where commissioning is included, the commissioning work as defined in the specifications must be complete prior to the issuance of substantial completion.

9.4 FINAL PAYMENT

9.4.1 Final payment, including the five percent (5%) retainage if determined appropriate, shall be made within thirty (30) days after the Work is fully completed and the Contract fully performed and provided that the Contractor has submitted the following closeout documentation (in addition to any other documentation required elsewhere in the Contract Documents):

9.4.1.1 Evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the work have been paid,

9.4.1.2 An acceptable RELEASE OF LIENS,

9.4.1.3 Copies of all applicable warranties,

9.4.1.4 As-built drawings,

9.4.1.5 Operations and Maintenance Manuals,

9.4.1.6 Instruction Manuals,

9.4.1.7 Consent of Surety to final payment.

9.4.1.8 The Owner reserves the right to retain payments, or parts thereof, for its protection until the foregoing conditions have been complied with, defective work corrected and all unsatisfactory conditions remedied.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY
10.1 The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take all reasonable precautions to prevent damage, injury or loss to: workers, persons nearby who may be affected, the Work, materials and equipment to be incorporated, and existing property at the site or adjacent thereto. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons and property and their protection from injury, damage, or loss. The Contractor shall promptly remedy damage and loss to property at the site caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.

10.2 The Contractor shall notify the Owner in the event any existing hazardous material such as lead, PCBs, asbestos, etc. is encountered on the project. The Owner will arrange with a qualified specialist for the identification, testing, removal, handling and protection against exposure or environmental pollution, to comply with applicable regulation laws and ordinances. The Contractor and Architect will not be required to participate in or to perform this operation. Upon completion of this work, the Owner will notify the Contractor and Architect in writing the area has been cleared and approved by the authorities in order for the work to proceed. The Contractor shall attach documentation from the authorities of said approval.

10.3 As required in the Hazardous Chemical Information Act of June 1984, all vendors supplying any materials that may be defined as hazardous, must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a warning caution on the label relating to a potential physical or health hazard, if it is known to be present in the workplace, and if employees may be exposed under normal conditions or in any foreseeable emergency situation. Material Safety Data Sheets must be provided directly to the Owner along with the shipping slips that include those products.

10.4 The Contractor shall certify to the Owner that materials incorporated into the Work are free of all asbestos. This certification may be in the form of Material Safety Data Sheet (MSDS) provided by the product manufacturer for the materials used in construction, as specified or as provided by the Contractor.

ARTICLE 11: INSURANCE AND BONDS

11.1 The Contractor shall carry all insurance required by law, such as Unemployment Insurance, etc. The Contractor shall carry such insurance coverage as they desire on their own property such as a field office, storage sheds or other structures erected upon the project site that belong to them and for their own use. The Subcontractors involved with this project shall carry whatever insurance protection they consider necessary to cover the loss of any of their personal property, etc.

11.2 Upon being awarded the Contract, the Contractor shall obtain a minimum of two (2) copies of all required insurance certificates called for herein, and submit one (1) copy of each certificate, to the Owner, within 20 days of contract award.

11.3 Bodily Injury Liability and Property Damage Liability Insurance shall, in addition to the coverage included herein, include coverage for injury to or destruction of any property arising out of the collapse of or structural injury to any building or structure due to demolition work and evidence of these coverages shall be filed with and approved by the Owner.

11.4 The Contractor's Property Damage Liability Insurance shall, in addition to the coverage noted herein, include coverage on all real and personal property in their care, custody and control damaged in any way by the Contractor or their Subcontractors during the entire construction period on this project.

11.5 Builders Risk (including Standard Extended Coverage Insurance) on the existing building during the entire construction period, shall not be provided by the Contractor under this contract. The Owner shall insure the existing building and all of its contents and all new alteration work under this
contract during entire construction period for the full insurable value of the entire work at the site. Note, however, that the Contractor and their Subcontractors shall be responsible for insuring building materials (installed and stored) and their tools and equipment whenever in use on the project, against fire damage, theft, vandalism, etc.

11.6 Certificates of the insurance company or companies stating the amount and type of coverage, terms of policies, etc., shall be furnished to the Owner, within 20 days of contract award.

11.7 The Contractor shall, at their own expense, (in addition to the above) carry the following forms of insurance:

11.7.1 **Contractor's Contractual Liability Insurance**

Minimum coverage to be:

- **Bodily Injury**
  - $500,000 for each person
  - $1,000,000 for each occurrence
  - $2,000,000 aggregate

- **Property Damage**
  - $1,000,000 for each occurrence
  - $2,000,000 aggregate

11.7.2 **Contractor's Protective Liability Insurance**

Minimum coverage to be:

- **Bodily Injury**
  - $500,000 for each person
  - $1,000,000 for each occurrence
  - $2,000,000 aggregate

- **Property Damage**
  - $500,000 for each occurrence
  - $1,000,000 aggregate

11.7.3 **Automobile Liability Insurance**

Minimum coverage to be:

- **Bodily Injury**
  - $1,000,000 for each person
  - $1,000,000 for each occurrence

- **Property Damage**
  - $500,000 per accident

11.7.4 Prime Contractor's and Subcontractors' policies shall include contingent and contractual liability coverage in the same minimum amounts as 11.7.1 above.

11.7.5 **Workmen's Compensation (including Employer's Liability):**

11.7.5.1 Minimum Limit on employer's liability to be as required by law.

11.7.5.2 Minimum Limit for all employees working at one site.

11.7.6 Certificates of Insurance must be filed with the Owner guaranteeing fifteen (15) days prior notice of cancellation, non-renewal, or any change in coverages and limits of liability shown as included on certificates.

11.7.7 **Social Security Liability**
11.7.7.1 With respect to all persons at any time employed by or on the payroll of the Contractor or performing any work for or on their behalf, or in connection with or arising out of the Contractor’s business, the Contractor shall accept full and exclusive liability for the payment of any and all contributions or taxes or unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed by the Government of the United States and the State or political subdivision thereof, whether the same be measured by wages, salaries or other remuneration paid to such persons or otherwise.

11.7.7.2 Upon request, the Contractor shall furnish Owner such information on payrolls or employment records as may be necessary to enable it to fully comply with the law imposing the aforesaid contributions or taxes.

11.7.7.3 If the Owner is required by law to and does pay any and/or all of the aforesaid contributions or taxes, the Contractor shall forthwith reimburse the Owner for the entire amount so paid by the Owner.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.1 The Contractor shall promptly correct Work rejected by the Owner or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed, and shall correct any Work found to be not in accordance with the requirements of the Contract Documents within a period of two years from the date of Substantial Completion, or by terms of an applicable special warranty required by the Contract Documents. The provisions of this Article apply to work done by Subcontractors as well as to Work done by direct employees of the Contractor.

12.2 At any time during the progress of the work, or in any case where the nature of the defects shall be such that it is not expedient to have them corrected, the Owner, at their option, shall have the right to deduct such sum, or sums, of money from the amount of the contract as they consider justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 CUTTING AND PATCHING

13.1.1 The Contractor shall be responsible for all cutting and patching. The Contractor shall coordinate the work of the various trades involved.

13.2 DIMENSIONS

13.2.1 All dimensions shown shall be verified by the Contractor by actual measurements at the project site. Any discrepancies between the drawings and specifications and the existing conditions shall be referred to the Owner for adjustment before any work affected thereby has been performed.

13.3 LABORATORY TESTS

13.3.1 Any specified laboratory tests of material and finished articles to be incorporated in the work shall be made by bureaus, laboratories or agencies approved by the Owner and reports of such tests shall be submitted to the Owner. The cost of the testing shall be paid for by the Contractor.

13.3.2 The Contractor shall furnish all sample materials required for these tests and shall deliver same without charge to the testing laboratory or other designated agency when and where directed by the Owner.

13.4 ARCHEOLOGICAL EVIDENCE

13.4.1 Whenever, in the course of construction, any archaeological evidence is encountered on the surface or below the surface of the ground, the Contractor shall notify the authorities of the Delaware Archaeological Board and suspend work in the immediate area for a reasonable time to permit those
authorities, or persons designated by them, to examine the area and ensure the proper removal of the archaeological evidence for suitable preservation in the State Museum.

13.5 GLASS REPLACEMENT AND CLEANING

13.5.1 The General Contractor shall replace without expense to the Owner all glass broken during the construction of the project. If job conditions warrant, at completion of the job the General Contractor shall have all glass cleaned and polished.

13.6 WARRANTY

13.6.1 For a period of two (2) years from the date of substantial completion, as evidenced by the date of final acceptance of the work, the contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect of equipment, material or workmanship performed by the contractor or any of his subcontractors or suppliers. However, manufacturer's warranties and guarantees, if for a period longer than two (2) years, shall take precedence over the above warranties. The contractor shall remedy, at his own expense, any such failure to conform or any such defect. The protection of this warranty shall be included in the Contractor's Performance Bond.

ARTICLE 14: TERMINATION OF CONTRACT

14.1 If the Contractor defaults or persistently fails or neglects to carry out the Work in accordance with the Contract Documents or fails to perform a provision of the Contract, the Owner, after seven days written notice to the Contractor, may make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor. Alternatively, at the Owner's option, and the Owner may terminate the Contract and take possession of the site and of all materials, equipment, tools, and machinery thereon owned by the Contractor and may finish the Work by whatever method the Owner may deem expedient. If the costs of finishing the Work exceed any unpaid compensation due the Contractor, the Contractor shall pay the difference to the Owner.

14.2 "If the continuation of this Agreement is contingent upon the appropriation of adequate state, or federal funds, this Agreement may be terminated on the date beginning on the first fiscal year for which funds are not appropriated or at the exhaustion of the appropriation. The Owner may terminate this Agreement by providing written notice to the parties of such non-appropriation. All payment obligations of the Owner will cease upon the date of termination. Notwithstanding the foregoing, the Owner agrees that it will use its best efforts to obtain approval of necessary funds to continue the Agreement by taking appropriate action to request adequate funds to continue the Agreement."

END OF SECTION 00 81 13
4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds maintain testing data that includes but is not limited to the data elements below.

Project Number: ________________________________

Project Name: ________________________________

Contractor/Subcontractor Name: ________________________________

Contractor/Subcontractor Address: ________________________________

Number of employees who worked on the jobsite during the report period: ____________

Number of employees subject to random testing during the report period: ____________

Number of Negative Results ____________ Number of Positive Results ____________

Action taken on employee(s) in response to a failed or positive random test:

______________________________________________________________________________

______________________________________________________________________________

Date: ________________

This form is not required to be submitted to the Owner. Included as a reference to show information required to be maintained by the Contractor. The Owner shall have the right to periodically audit all Contractor and Subcontractor test results at the Contractor’s or Subcontractor’s offices (or by other means to make the data available for inspection by the Owner).
EMPLOYEE DRUG TESTING
REPORT OF POSITIVE RESULTS

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds to notify the Owner in writing of a positive random drug test.

Project Number: ____________________________________________

Project Name: ____________________________________________

Contractor/Subcontractor Name: ____________________________________________

Contractor/Subcontractor Address: ____________________________________________

Name of employee with positive test result: ____________________________

Last 4 digits of employee SSN: __________

Date test results received: ______________

Action taken on employee in response to a positive test result:
________________________________________________________________________
________________________________________________________________________

Authorized Representative of Contractor/Subcontractor: ____________________________
(typed or printed)

Authorized Representative of Contractor/Subcontractor: ____________________________
(signature)

Date: ______________

This form shall be sent by mail to the Owner within 24 hours of receipt of test results.

Enclose this test results form in a sealed envelope with the notation "Drug Testing Form – DO NOT OPEN" on the face thereof and place in a separate mailing envelope.
To: DSU Facilities and Planning & Construction  
From: Safety and Risk Management Department  

RE: Procedure and Protocol Notice for placing any DSU Building on Test Mode

All internal and external contractors are required to do the following procedure when performing a project task in any DSU Building:

- Call DSU Public Safety dispatch center (302-857-7911) and the Local Fire Department (302-736-7168) to notify the respected areas that work will be performed and have the **Building to be put on Test**.

In accordance with the State of Delaware fire prevention code Title 16, Chapter 66 -Any contractor doing work on DSU Campuses must make contact with the local fire dept. and DSU public safety to inform them that they will be site doing a project. They are also required to inform Public Safety when the project will be started and finished for building testing purposes each day.
SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, plants and grass to remain.
2. Removing existing trees and other vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place and removing site utilities.
7. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:

1. Division 01 Section "Temporary Construction Utilities, Facilities & Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities.
2. Division 31 Section "Earth Moving" for soil materials, excavating, backfilling, and site grading.
3. Division 32 Section "Turf and Grasses" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. 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.

B. 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.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS
A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 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 authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. The contractor is responsible for all costs associated with a utility locator service.

C. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earth Moving."
   1. Obtain approved borrow soil materials off-site when satisfactory soil materials are 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 flag trees and 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.
D. Contact DNREC, Division of Sediment and Stormwater and the City of Dover Department of Planning and Inspections to arrange a preconstruction meeting prior to any site clearing or site disturbance activities.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to approved Sediment and Erosion Control Drawings.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

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

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Construction Manager will arrange to shut off indicated on-site utilities when requested by Contractor.

B. 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 Construction Manager and Owner not less than five days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Construction Manager’s written permission.
3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
   4. Use only hand methods for grubbing within tree protection zone.
   5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations 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.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Do not stockpile topsoil within tree protection zones.
   2. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.8 DISPOSAL
A. Disposal: 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.

END OF SECTION 311000
SECTION 312000 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Conditions, any Supplementary General Conditions and Division 1, General Requirements, are hereby made a part of this Section as fully as if repeated herein.

1.2 SECTION INCLUDES

A. Earthwork includes areas below building foundations, below concrete slabs on grade, below paved areas and grading of all unpaved area in the site.

1. Layout and staking for earthwork.
2. Excavation and rough grading.
3. Erosion and sediment control.
4. Foundation excavation for footings.
5. Establishing subgrades, leveling and proof rolling.
6. Filling, backfilling and compaction.
7. Keeping streets clean of materials tracked off site.
8. Includes trenching, excavation and backfill for utilities.
9. Maintenance and/or repair of damage to the rough grading.
10. Removal and disposal of stones, debris, excess and unsuitable materials.
11. Soil treatment for termite control.
12. Field quality control, testing, and inspection.

1.3 DEFINITIONS

A. Rock Excavation: Natural geological formations or other material which cannot be removed by adequate equipment (in good condition) as defined below, shall be considered a change in the scope of work and paid for by the Owner if encountered.

1. Open Excavation and Grading: Rock in excess of the capabilities of a Caterpillar D-8 tractor (or equivalent) with 2 cu. yd. bucket and hydraulically operated single tooth power ripper.
2. Trenches, Pits and Footings: Rock in excess of the capabilities of a Caterpillar 235 Hydraulic Backhoe (or equivalent) using a 2 ft. Bucket width (3/4 cu. yd.)
3. Minimum Effort: If rock is not removed during the process of normal digging and ripping, then extend the excavation to expose the rock surface within the limit of original excavation. Contact the A/E and he may direct the sides of rock to be exposed to a depth of 3 feet. This will be to determine to the extent of additional work.

B. Earth Excavation: Anything not classified as rock including as example: soils, gravels, stones, boulders, vegetation, debris, and unsuitable materials.

C. Unsuitable Materials: All excavated materials; debris, man made or fabricated materials, concrete spoil, organic, soft, expansive, or unstable matter; all shall be disposed of as herein specified. Excessive moisture content shall not classify a material as unsuitable.
D. Removal and disposal of unsuitable material above the subgrade elevation and placement of approved specific fill material (from on or off the site) above the subgrade elevation as directed by the Soils Engineer shall be considered a part of the work.

E. Removal and disposal of unsuitable material approved below the subgrade elevation and placement of approved specific fill material (from on or off the site) below the subgrade elevation as directed by the Soils Engineer shall be considered a change in the scope of work.

F. Soils Engineer or Inspection Agency: An Agency and its designated representatives who monitor and approve all earthwork operations described herein.

G. Subgrade: The finished elevation of the earth immediately below all slabs, granular and porous fill, paving, footings, walls, etc., except the subgrade elevation shall not be higher than 12” below the existing earth elevation at the start of the project.

H. Subgrade for utility construction: Underside of barrel of pipe, or underside of any cradle or bedding if noted on drawings or referenced in applicable local government specifications. For pipe drains and miscellaneous structures encased in concrete or on concrete, stone and/or gravel cradle, subgrade is lowest outside surface of encasement or cradle.

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. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

K. Drainage Course: Course supporting the slab on grade that also minimizes upward capillary flow of pore water.

L. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

M. Utilities: On site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

N. Filter Material: Course placed around drainage pipes.

1.4 QUALITY ASSURANCE

A. Reference Standards:

1. American Association of State Highway and Transportation Officials (AASHTO).
3. Delaware Department of Transportation, State Highway Administration “Standard Specifications for Materials and Construction”, as amended to date (DelDOT as hereinafter referred). Delete references to Measurement and Payment.

B. Geotechnical Testing Agency Qualifications: An independent testing agency (with a Geotechnical engineer licensed in the state where the project is being constructed on staff) qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
C. Tolerances: As indicated herein.

D. Testing: Requirements as specified herein.

1.5 SUBMITTALS

A. Notification:

1. Notify and provide data to regulatory authorities and A/E prior to commencement of work.
2. Provide notice of: encounter with unknown utilities; subgrades before filling; areas requiring testing or inspection.

B. Product Data: For the following:

1. Geotextile.
2. Detection Warning Tape.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D2487 of each on site and borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D1557 for each on site and borrow soil material proposed for fill and backfill.
3. Field reports; in-place soil density tests.
4. One optimum moisture – maximum density curve for each type of soil encountered.
5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.
6. Test reports must be submitted daily to the Architect and Owner.

1.6 PROJECT CONDITIONS

A. Subsurface Conditions: Subsurface soils investigations have been made at the site. The report and logs of the test borings and test pits are included in the Appendix of these specifications. Such investigations have been made for the purposes of design only and neither the Engineers, the Owner, nor the Geotechnical Engineer guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. Such information is made available for general information only and shall not relieve the Contractor of the responsibility for making his own investigations, tests, and analysis. Any additional test borings and other exploratory operations may be made by Contractor shall be at no cost to Owner.

1. See Geotechnical Engineering Report prepared by ECS Mid-Atlantic, L.L.C. in Division 1 for test boring data and other requirements.

B. Erosion and sediment control, in addition to erosion control specified in Section 31100 and Division 1:

1. Standards: Comply with the requirements of the "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas" by the U.S.D.A. Soil Conservation Service.
2. General Erosion: Prevent erosion of earthwork; repair and correct any ditches, gullies or erosion immediately and upon occurrence.
3. Excavations: Prevent water from flowing into open excavations and toward building walls.
4. Slopes: Cover (with continuous plastic membrane) and stake all slopes steeper than 1.5 horizontal to 1 vertical.

C. Environmental Conditions:
   1. Do not apply soil treatment when temperature is at or below freezing or when ground is frozen or frost is expected.
   2. Do not apply soil treatment when surface water is present.

D. Existing Conditions: Accept the site in the condition which it exists at the time of the award of the contract and perform all work to the grades indicated.
   1. Protect plant material, lawns and other features not designated for removal.
   2. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

E. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
   1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.
   2. Do not interrupt existing utilities serving facilities occupied and used by others, except when permitted in writing by A/E and then only after acceptable temporary utility services have been provided. Provide a minimum of 72 hour notices to utility Owners and receive written notice to proceed before interrupting any utility.

F. Rock Excavation: Rock excavation may be performed with hoe rams, jack hammers, or any method the Contractor wishes to employ except for explosives.

1.7 PROTECTION

A. Safety: Provide protective measures necessary for the safety of workmen, to the public and adjacent property. Prevent cave-ins, collapse of walls, structures and slopes, both on and adjacent to the site.

B. Standards: Comply with regulations of local authorities having jurisdiction, including all applicable O.S.H.A. requirements.

C. Repair: Includes the removal and replacement with new materials all materials so affected by settlement.

PART 2 - PRODUCTS

2.1 FILL AND BACKFILL
A. Satisfactory Soils:

1. Compacted fill and backfill shall be free of deleterious matter such as frozen materials, organics, wood, debris, or rock larger than 4 inches in diameter and be classified SP, SW, SM, SC, GP, GC, GM, or GW per ASTM D-2487. All material shall have a liquid limit and plasticity index not exceeding 40 and 20 respectively when tested in accordance with ASTM D-4318.
2. The minimum dry unit weight shall not be less than 105 PCF maximum dry density as determined by ASTM D-1557, modified proctor.
3. All fill and backfill materials shall be obtained from on site or from off site sources and shall be approved by the Geotechnical Engineer prior to placement.
4. Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with a least 90 percent passing a 1 ½ inch sieve and not more than 12 percent passing a No. 200 sieve.

1. Locations: All on site fill areas

C. Structural Fill: On-site soils free of organic material, topsoil, miscellaneous fill, debris and rock fragments in excess of 3 inches in their largest dimension may be suitable as structural fill. The granular on-site soils may be suitable for re-use as structural fill. Some of these soils have an in-situ moisture content that exceeds the typical range that would allow the recommended compaction to be achieved. Therefore, drying of these soils may be required to achieve the recommended compaction.

If sufficient quantities of suitable on-site soils are not available for structural fill, imported borrow consisting of predominately granular soils conforming to the requirements of the Delaware Department of Transportation Standard Specifications Select Borrow, Type G should be utilized or AASHTO SP-57 stone.

D. Drainage fill:

1. Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel, (ASTM D 448 Coarse - aggregate grading size 57), with 100% passing of 1-1/2” sieve and not more than 5% passing a No. 8 sieve. Aggregate shall meet DELDOT specification for No. 106A aggregate. Provide by Contractor from off site source.

   a. Locations: All concrete slab on grade areas

2. For foundation drainage, use aggregate meeting DELDOT specification for No. 113 aggregate.

   a. Locations: Drainage fill behind basement walls and retaining walls.

E. Stone Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, reclaimed concrete, and natural or crushed sand (ASTM D2490) with at least 95% passing a 1 ½” sieve and not more than 8% passing a No. 200 sieve. Provide by contractor from off site sources.
F. Subbase Material: Designation CR-6 in accordance with DELDOT Specifications.
   1. Locations: All vehicular traffic areas

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1 inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve. For utility installations, bedding shall conform to AASHTO #57 stone.

H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; AASHTO M-43, size No. 17.

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

J. Processed Rubble Fill: Existing brick and concrete rubble, free of wood and steel may be processed by use of tracked equipment such that no particle size greater than 6 inches in the longest dimension remains.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 FILL AND BACKFILL FOR UTILITIES

A. Backfill: Earth removed from the trench provided that in the opinion of Soils Engineer such excavated material is satisfactory for backfilling.

B. Should the excavated material be considered unsatisfactory for backfilling, the Contractor shall remove and dispose of such unsatisfactory material and substitute, in lieu thereof, suitable material obtained from elsewhere on or off the site.

C. Materials shall meet the requirements specified in paragraph 2.1.A above.

2.3 TOPSOIL

A. Refer to Section 329200 Turf and Grasses.

2.4 SOIL TREATMENT - TERMITE CONTROL

A. Emulsion soil chemicals of only water-based type. Do not use any fuel oil as a diluent.

B. Solutions and chemicals listed and approved by EPA, USDA, and Delaware State Department of Agriculture.

C. Chemicals used in retreatment shall also be certified and state type of chemical and rate of concentration.

2.5 ACCESSORIES

A. Detectable Warning Tape: Acid and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) 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 (750 mm) 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.

2.6 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. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 56 lbf; ASTM D 4533.
5. Puncture Strength: 56 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
8. 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. Grab Tensile Strength: 247 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 90 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.7 FLOWABLE FILL

A. Stabilized flowable fly ash mixture with a maximum slump of 8" and a minimum unconfined compressive strength of 100 psi used to fill construction excavations.

B. Manufacturer: American Stone Mix or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify existing ground surfaces have been stripped of topsoil, root mat and existing pavement, unsatisfactory soils, concrete spoil, obstructions and deleterious material.
B. Following rough grading and prior to foundation excavation, placement of fill, or construction of the floor slabs, it is recommended that the exposed subgrade be proofrolled. The proofroll should be performed using a minimum 10-ton vibratory roller in the presence of the qualified soils technician working under the supervision of a geotechnical engineer. Yielding or otherwise unsuitable subgrade conditions encountered within the proposed building areas should be undercut to firm subgrade conditions and backfilled with compacted structural fill.

C. Locate underground utilities in areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Contact "Miss Utility".

D. Use of explosives will not be permitted, unless approved by Owner in writing and Regulatory Agencies having jurisdiction.

E. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

F. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

G. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

H. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 EXCAVATION

A. Excavation consists of removal and disposal of material encountered when establishing required finish grade elevations.

B. Unauthorized Excavations:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of A/E. Unauthorized excavation, as well as remedial work directed by A/E, shall be at Contractor's expense.

2. Under footings, foundations, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing to excavation bottom, without altering required top elevation. Lean concrete, fly-ash fill, or compacted structural fill may be used to bring elevations to proper position, when acceptable by A/E.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Soils Engineer who will make an inspection of conditions.

1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated materials as directed by A/E

2. Removal of unsuitable material below the subgrade elevation and its replacement as directed will be paid by the Owner on basis of contract conditions relative to change in work.
D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of materials excavated.

1. Maintain sides and slopes of excavations in safe conditions until completion of backfilling.

E. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition.

1. Establish requirements for trench shoring and bracing to comply with local, State & Federal codes and authorities having jurisdiction.
2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

F. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Excavations shall be kept free of water for a minimum of two (2) inches below subgrade of excavation. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Convey water removed from excavations and rain water into approved sediment control devices. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
3. Excessive groundwater conditions: Refer to Article 4.3.6 of the General Conditions.

G. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

1. Prevent saturation of soil above the optimum moisture content.
2. Locate and retain soil materials away from edge of excavations.
3. Dispose of excess soil material and waste materials as herein specified.

H. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10' and extending sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. If in excavating for building foundations the soil directly below the building foundations is disturbed, the disturbed soil shall be removed and shall be recompacted to 95% compaction or replaced with concrete backfill.

I. Excavation for Stone and Concrete Pavements: Cut surface under pavements to comply with cross sections, elevations and grades as shown:
1. Where rock or concrete spoil is encountered, carry excavation 18" below subgrade and backfill with suitable material approved by the A/E.

J. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed with ample working room.

1. Excavate trenches to depth, lines, gradients, and elevations indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze ups.

2. Where rock is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel prior to installation of pipe.

3. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
   a. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   b. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

4. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing. Concrete is specified in Division 3.

5. Do not backfill trenches until tests and inspections have been made and backfilling authorized by A/E. Use care in backfilling to avoid damage or displacement of pipe systems.

K. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F. (1 degree C.).

L. Ground Surface Preparation (Structural and Pavement areas):

1. The existing ground surface in the structural and pavement areas shall be stripped of topsoil, root mat, existing pavements, unsatisfactory soils, concrete spoil, obstructions and deleterious material. Base course material from the existing pavements may remain if approved by the A/E. The entire area shall be proof rolled, a minimum of four (4) passes, with a loaded dump truck with a minimum axle load of 10 tons in the presence of the soils engineer. Soft spots identified by the Soils Engineer during proof rolling will be undercut and backfilled in accordance with Section 3.4. Proof rolling and compaction equipment shall meet the requirements of Section 3.3.D. Undercutting and backfilling operations for eliminating soft spots above the subgrade elevation shall be included in the base bid.

2. In cut areas, prior to the construction of paving or concrete slab on grade, the entire subgrade shall be proof rolled in the presence of the Soils Engineer. Soft areas encountered during proof rolling shall be undercut and backfilled in accordance with section 3.4. Proof rolling and compaction equipment shall be in compliance with Section 3.3 D. The cost of undercutting and backfilling above the subgrade elevation shall be included in the base bid.
M. Earthwork Quantities:

1. Contractor shall be responsible for determining earthwork quantities for the completion of the work.

3.3 COMPACTION

A. General: Control soil compaction during construction providing percentage of dry density specified for each area classification.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of the maximum dry density, which is determined in accordance with ASTM D 1557, or in accordance with ASTM D 2049 for soils which will not exhibit a well defined moisture density relationship.

1. Structural, pavement and walkway areas, steps and utility trenches - 95% of the maximum dry density.
2. Lawn areas outside the designated structural fill limits – minimum compaction 90% of the maximum dry density.

C. Moisture Control: Obtaining a uniformly high degree of compaction requires control over the moisture content of the material being placed in the fills and backfill. The soils used in fill and backfill shall be brought to within 3% of optimum moisture at no additional cost to the Owner.

1. Where the soil layer is too dry, the Contractor shall apply water uniformly using approved equipment to increase the moisture content to within 3% of the optimum, taking precautions to prevent free water from appearing on the surface during or subsequent to compaction operations.
2. Where the soil layer is too wet, the Contractor shall dry the soils by plowing or discing to aerate the soil and reduce the moisture content to within 3% of the optimum.

D. Compaction equipment shall be as required to complete the scope of work outlined in the geotechnical report, contract documents and specifications for this project.

3.4 BACKFILL AND FILL

A. General: Place acceptable soil material in layers not more than eight (8) inches in thickness to required subgrade elevations, for each area classification listed below. Each layer shall be compacted to the requirements of Section 3.3B.

1. Fill and backfill within building and pavement limits and in utility trenches shall be structural fill soils meeting the requirements of Section 2.1.A.
2. Under lawn areas outside the designated structural fill limits, backfill and fill soils shall be soils meeting the requirements of Section 2.1.A, or other on site materials approved by the Geotechnical Engineer.
3. Fill and backfill located below walkways and steps shall be constructed of structural fill soils meeting the requirements of Section 2.1.A.
4. Drainage fill material shall be proof rolled to a uniform stable condition prior to placement of vapor retarder.
5. Stone base course shall be compacted to 95% maximum dry density per ASTM D-1557.

B. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Acceptance of construction below finish grade including, where applicable, subdrainage damp proofing, waterproofing, and perimeter insulation.
2. Concrete and masonry have cured 28 days and is adequately braced.
3. Inspection, testing, approval, and recording locations of underground utilities.
5. Removal of trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

C. Ground surface preparation: Shall be in accordance with Section 3.2K.

1. When existing ground surface has density less than that specified under Section 3.3B for particular area classification, break up ground surface, pulverize, moisture condition to optimum moisture content, and compact to required depth and percentage of maximum dry density.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth, for material compacted by heavy compaction equipment and not more than 4" in loose depth for material compacted by hand operated tampers.

1. Before compaction, moisten or aerate each layer as may be necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density for each classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.
3. Structural fill shall extend a minimum of five (5) feet beyond building and road pavement limits and shall include the support slopes to their full width.
4. Backfilling against pipe structures, whose joints involve the use of cement mortar or other concrete, or where buttresses are constructed, shall not be done until mortar has set at least 12 hours.
5. Compaction over one foot above the pipe shall be done with approved mechanical tampers. Compaction density shall be as specified in Section 3.3.

E. Utility trench backfill

1. Place and compact initial backfill of subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
2. Coordinate backfilling with utilities testing.
3. 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 a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
4. Fill voids with approved backfill materials while shoring, bracing, and sheeting is removed.
5. Place and compact final backfill of satisfactory soil material to final subgrade.
6. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
3.5 ROUGH GRADING

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surfaces with specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. In fill areas, sloped surfaces steeper than 5 horizontal to 1 vertical shall be benched so that fill materials will be placed on a level surface. All fill subgrades shall be observed by the Geotechnical Engineer.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 2” above or below required subgrade elevations.
2. Walks: Shape surface or areas under walks to line, grade and cross section, with finish surface not more than .04’ above or below required subgrade elevation.
3. Pavements: Shape surface areas under pavement to line, grade and cross section, with finish surface not more than .04’ for bituminous surfaces and .08’ for stone surfaces, above or below required subgrade elevation.

C. Grading Surface or Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of .02’ when tested with a 10’ straightedge.

3.6 BUILDING SLAB BASE COURSE

A. General: Slab base course consists of placement of drainage fill or stone base course material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

B. Placing: Place slab base course on prepared subgrade in layers of uniform thickness, conforming to indicate cross section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. When a compacted drainage course is shown to be 6" thick or less, place material in a single layer. Where shown to be more than 6" thick, place material in equal layers, except no single layers more than 6” or less than 3” in thickness when compacted.

C. Any ruts or soft yielding spots which may occur or any areas having inadequate compaction or deviations from the requirements set forth herein shall be corrected by removing and adding uniformly graded crushed stone or by loosening crushed gravel, reshaping and recompacting. The subgrade shall have a uniform density throughout its entire depth and width and shall be approved by the A/E prior to pouring any concrete.

D. Following this preparation, the subgrade shall be protected from damage as described below:

1. The subgrade shall be protected from damage by heavy loads or equipment moving on tracks or cleats.
2. The contractor shall at all times keep the subgrade drained.
3. No concrete shall be deposited upon a frozen subgrade nor, until the subgrade has been approved by the A/E.
4. Immediately in advance of placing concrete, the subgrade shall be sprinklered with as much water as it can readily absorb.

3.7 FINISH GRADING & PLACING TOPSOIL

A. Refer to Specification Section 329200 – “Turf and Grasses”

3.8 MAINTENANCE

A. Protection of graded areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and reestablish grades in settled, eroded and rutted areas to specified tolerances.

B. Reconditioning compacted areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

C. Restore areas previously occupied by stockpiled materials to match finished condition of the remainder of the work.

3.9 APPLICATION OF SOIL TREATMENT

A. Refer to Section 313116 Termite control

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Owner's Property: Remove waste materials including trash, debris, and unsuitable and excess excavated material, and dispose of off Owner's property.

3.11 FIELD QUALITY CONTROL – SOILS

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

1. Perform field density tests in accordance with ASTM D 1556 (sand cone method) or ASTM D 2922 and D-3017(shallow depth nuclear method), as applicable.

2. Paved Areas and Building Slab Subgrade: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab area, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 2 tests. Field density tests shall be made at all walkway entrances and ramps into the proposed building.

3. Foundation Wall Backfill: Take enough field density tests to ensure backfill is being properly compacted.

4. Utility Trench Backfill: Perform field density tests on a spot-check basis to assist the Contractor in determining if compaction is in accordance with the specifications.

5. If in opinion of A/E, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

6. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent evaluation and approval of each footing subgrade should be performed by Geotechnical Testing Agency.
7. Costs of testing and inspection shall be borne by the Contractor.

3.12 FIELD QUALITY CONTROL - SOIL TREATMENTS

A. Pay costs for required testing of termite control materials. Samples shall be taken and analyzed by an independent testing laboratory.

B. Sampling: Test one sample of working solution for each 10,000 square feet of area applied. Take samples from discharge end of spraying equipment for each batch mixed and applied if less than 10,000 square feet.

C. Retreating: Retreat all areas if the test results average less than 90 percent of listed minimum concentration.

3.13 TESTING AND INSPECTION

A. INSPECTION AGENCY: Construction Manager will employ an Independent Testing agency for purposes of inspecting and testing construction of embankments, fills, backfills, trenches, and subgrades and report to the A/E conformance in all particulars to specification requirements.

B. Scheduling:
   1. Assign qualified personnel to be on site at all times when operations are scheduled.
   2. The Contractor should note that no earthwork operation shall be permitted in their absence.

C. Responsibilities:
   1. Evaluation of subgrade preparation and suitability.
   2. Moisture content and field density tests on all layers of fill and backfill material placed.
   3. Evaluation of degree of compaction attained for all fill and backfill material placed.
   4. Testing and evaluation of borrow material.
   5. Sources of borrow and of select fill.
   6. Footing subgrade suitability.
   7. Inspection of installation of Subdrainage system.

D. Results of Tests:
   1. Make results available to the Soils Engineer and A/E immediately upon completion of areas of layers.

E. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project. A discussion of all deviations from the contract documents and specifications, with their related impact on the final construction, shall be described in detail. The engineer of record shall review this final report and recommend corrective measures (as deemed necessary) that must be made prior to final acceptance of the work. Prior to final payment, a written report certifying that the work meets the requirements of the contract documents, specifications, and all governing agencies shall be prepared, submitted, and approved by the A/E.
END OF SECTION 312000
SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 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 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Samples: 10-lbsample of exposed aggregate.

D. Qualification Data: For manufacturer. Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

E. Material Test Reports: General contractor will engage a qualified testing agency for indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.
   5. Curing compounds.
   7. Bonding agent or epoxy adhesive.
   8. Joint fillers.

G. Field quality-control test reports.

H. For plazas and wide walkways, submit control joint spacing plan for review.

I. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.


D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
   2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete producer.
   d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

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. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, 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, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 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 with 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.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.


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

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

H. Plain Steel Wire: ASTM A 82, as drawn.

I. Deformed-Steel Wire: ASTM A 496.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, plain.

K. 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.

L. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.

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

N. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

O. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.
2.4 CONCRETE MATERIALS

A. Materials: All materials including but not limited to reinforcing materials, concrete materials, concrete mix, admixtures, curing materials, traffic paint and other related materials used under this section shall conform to the requirements of the Delaware Department of Transportation Specifications for Road and Bridge Construction. References to a required class of concrete shall correspond to the classes as shown in the State of Delaware Department of Transportation Specifications for Road and Bridge Construction Division 500 and Division 1000.

B. Fly ash shall meet the approval of the ASTM C-618 pozzolan Class F and may be used as a partial substitute for cement when approved by the Architect.

C. The concrete mix used in performing this work shall be DelDOT Class “A” or DelDOT Class “B” depending on the compressive strength shown on the details and shall meet the approval of the Architect.

D. The concrete temperature shall not exceed 90°F when delivered to the job-site or at any time prior to placement in the forms.

E. Type I - Portland Cement: Shall be used from October 1 through May 1 and when the air temperature in the shade and away from artificial heat is above 70°F or less, or as directed by the Architect.

F. When approved by the Architect, Hi-Early strength concrete may be used. Approval will be on a case by case basis.

G. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
   1. Aggregate Sizes: 1/2 to 3/4 inch nominal.
   2. Aggregate Source, Shape, and Color: Submit color samples for review by Architect and owner

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


J. Chemical Admixtures: Admixtures may only be used with prior approval by the Architect. Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

   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.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

A. Synthetic Fiber: fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

1. Available Products:
   a. Fibrillated Fibers:
      1) Axim Concrete Technologies; Fibrasol F.
      2) FORTA Corporation; Forta.
      3) Euclid Chemical Company (The); Fiberstrand F.
      4) Grace, W. R. & Co.--Conn.; Grace Fibers.
      5) SI Concrete Systems; Fibermesh.

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

1. Available Products:
   a. Axim Concrete Technologies; Cimfilm.
   b. Burke by Edeco; BurkeFilm.
   c. ChemMasters; Spray-Film.
   d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
   e. Dayton Superior Corporation; Sure Film.
   f. Euclid Chemical Company (The); Eucobar.
   g. Kaufman Products, Inc.; Vapor Aid.
   h. Lambert Corporation; Lambco Skin.
   i. L&M Construction Chemicals, Inc.; E-Con.
   j. MBT Protection and Repair, ChemRex Inc.; Confilm.
   l. Metalcrete Industries; Waterhold.
   m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
   n. Sika Corporation, Inc.; SikaFilm.
   o. Symons Corporation; Finishing Aid.
E. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

1. Available Products:
   a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
   b. Burke by Edoco; Resin Emulsion White.
   d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
   e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
   f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
   g. Kaufman Products, Inc.; Thinfilm 450.
   h. Lambert Corporation; Aqua Kure-White.
   i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
   k. Symons Corporation; Resi-Chem White.
   l. Tamms Industries, Inc.; Horncure 200-W.
   m. Unitex; Hydro White.
   n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.

2.7 RELATED MATERIALS


B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:

   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Chemical Surface Retarder: (For exposed aggregate concrete) Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

   1. Products:
      a. Burke by Edoco; True Etch Surface Retarder.
      b. ChemMasters; Exposee.
      c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
      d. Euclid Chemical Company (The); Surface Retarder S.
      e. Kaufman Products, Inc.; Expose.
      f. Metalcrete Industries; Surfard.
      g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
      h. Scofield, L. M. Company; Lithotex.
      i. Sika Corporation, Inc.; Rugasol-S.
      j. Vexcon Chemicals, Inc.; Certi-Vex Enviocure.
2.8 CONCRETE MIXTURES

A. The concrete mix used in performing this work shall be DelDOT Class “A” or DelDOT Class “B” depending on the compressive strength shown on the details and shall meet the approval of the Architect.

B. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

C. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi or 3000 psi, depending on location
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
3. Slump Limit: 2-5, plus or minus 1 inch.

D. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.

E. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

F. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture, plasticizing and retarding admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

G. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals. Limits shall be as follows per DelDOT requirements:

1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

H. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116 where synthetic fibers are noted on the plans. Furnish batch certificates for each batch discharged and used in the Work.

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.

2.10 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952.

1. Color: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations 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, 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 reinforcement 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 of adjacent mats.

3.5 JOINTS

A. General: Form 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 steel 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. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Doweled Joints: 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.

C. Isolation Joints: Form isolation 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 20 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. All Isolation Joints shall be treated with joint filler.
4. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface.
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. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. For larger walkways, width greater than 12’ and plazas, submit shop drawing of joint pattern. 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 grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Doweled Contraction Joints: 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. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, 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 time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to fresh concrete after testing.

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 according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

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.
I. Commence initial floating using bull floats or darbies to impart 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 surface treatments.

J. 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.

K. 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.

L. 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.

M. 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.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. 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 steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared, and 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. Construct test sections of each type of concrete paving, including at least one expansion joint and control joints, for review by CM, Owner and Architect for agreement of finish prior to starting concrete installation. Review will include texture of broom finish, joint striking, picture framing and geometric conformity.

2. 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. Incorporate “picture framing” of concrete in finish within lump sum prices bid.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. 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's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

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

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

   1. 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.

   2. 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.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

   1. Elevation: 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.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

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 composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with 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 321313
SECTION 321316 - DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Integrally colored concrete pavement
   2. Stamped concrete pavement

B. Related Sections:
   1. Division 32 Section “Cement Concrete Pavement” [“Concrete Paving”] for cast-in-place concrete pavement with other finishes.

1.2 SUBMITTALS

A. Submit according to Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each product indicated.

C. Mix Designs: For each type of integrally-colored concrete mix required.

D. Samples for Initial Selection: Manufacturer's color charts.

Delete optional text below for exterior concrete pavement or interior concrete floor that is not required.

E. Sample Panels: 4 feet by 4 feet, to demonstrate finish, color, and texture of decorative cement concrete pavement.

F. Qualification Data: For Installer and manufacturer specified in Quality Assurance Article, including names and addresses of completed projects, architects, and owners.

G. Material Test Reports: From testing agency indicating compliance of concrete materials, reinforcing materials, admixtures, and similar items with requirements.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Two year's experience with projects of similar scope and quality.

B. Manufacturer's Qualifications: Three year's experience manufacturing products required.

C. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077.
D. Source Limitations: Obtain products from same source throughout Project.

E. Field Samples: Locate at site and obtain approval before start of final work. Field samples shall be minimum 4 feet by 4 feet by full thickness.
   1. Demonstrate range of finishes and workmanship, including curing procedures.
   2. Approved field samples set quality standards for comparison with remaining work.
   3. Remove field samples when directed.

F. Preinstallation Conference: Conduct conference at site to comply with requirements of Division 1 Section “Project Meetings.”

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packaging with labels intact.

B. Store in clean, dry and protected location, according to manufacturer's requirements.

1.5 PROJECT CONDITIONS

A. Comply with requirements of Section 321313 - Concrete Paving.

PART 2 - PRODUCTS

2.1 FORMS

A. Comply with requirements of Section 321313 - Concrete Paving.

2.2 STEEL REINFORCEMENT

A. Comply with requirements of Section 321313 - Concrete Paving.

2.3 COLOR MATERIALS

A. Integral Concrete Liquid Colorant: ASTM C 979, admixture for integrally coloring concrete, consisting of non-fading synthetic mineral-oxides coloring pigments suspended in a pH adjusted water-based solution, dispensed at the batch plant, or premeasured in pails for job-site addition.
   1. Colors: Brick Red.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bon Tool Co.
      b. Brickform.
c. Butterfield Color.
d. ChemMasters.
e. Davis Colors.
f. Dayton Superior Corporation.
g. Decosup Inc.
h. Dynamic Color Solutions, Inc.
i. Elementis Pigments.
j. Hoover Color Corporation.
k. Lambert Corporation.
l. QC Construction Products.
m. Scofield, L. M. Company.
n. Solomon Colors, Inc.
o. Specialty Concrete Products, Inc.
p. Stampcrete International Ltd.
q. SureCrete Design Products.

B. Liquid Release Agent: Clear, evaporating formulation that facilitates release of stamp mats and texture rollers from colored concrete.

2.4 IMPRINTING TOOLS

A. Stamp Mats: Semi-rigid polyurethane mats with projected texture and ridged underside capable of imprinting texture and joint patterns to plastic concrete.
   1. Pattern: As shown on plans

B. Accessory Stamp Tools: Aluminum detailing tools capable of imprinting joints and dressing stamped joints of plastic concrete.

2.5 ADMIXTURES

A. Comply with requirements of Section 321313 - Concrete Paving.

B. Do not use calcium chloride or admixtures containing calcium chloride.

2.6 RELATED MATERIALS

A. Comply with requirements of Section 321313 - Concrete Paving for expansion joint filler, bonding agents, etc.

B. Bonding Agent: ASTM C 1059, Type II.
2.7 CURING AND SEALING MATERIALS

A. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 309, non-yellowing, VOC-compliant, high-gloss, clear liquid.
   a. Color to match integrally-colored concrete.

B. Flatten Paste: Manufacturer's standard product designed to reduce sealer gloss finish to matte finish.

2.8 INTEGRAL CONCRETE MIXES

A. Comply with requirements of Section 321313 - Concrete Paving and as follows:
   1. Minimum Portland Cement Content: Five sacks of cement per cubic yard.
   3. Air Content: 6 percent plus or minus 1 percent.

B. Add integral concrete colorant according to manufacturer's instructions.

C. Maintain mix characteristics for all concrete required to have matching finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine subgrade and sub base for compliance with requirements.

Delete optional text below for exterior concrete pavement or interior concrete floor that is not required.

B. Do not proceed with decorative cement concrete pavement until unacceptable conditions are corrected.

3.2 FORMWORK

A. Comply with requirements of Section 321313 - Concrete Paving.

3.3 STEEL REINFORCEMENT

A. Comply with requirements of Section 321313 - Concrete Paving.

3.4 CONCRETE PLACEMENT

A. Comply with requirements of Section 321313 - Concrete Paving.
B. Do not add water once placing has begun. Do not retemper concrete that has started to set.

3.5 STAMPING

A. Stamp concrete surfaces according to manufacturer's instructions.

B. Mat Stamping: While concrete is plastic, accurately align stamp mats in sequence and uniformly press into concrete to produce imprint pattern, texture, and depth of imprint, according to manufacturer's instructions. Remove stamps from concrete immediately.
   1. Stamp edges and surfaces unable to be imprinted with stamp mat with flexible stamping mats.

C. Remove unembedded pigmented powder release agent after interval recommended by manufacturer and according to manufacturer's instructions. Pressure wash surfaces according to manufacturer's instructions without damaging decorative concrete.

3.6 JOINTS

A. Comply with requirements of Section 321313 - Concrete Paving.

3.7 CURING AND SEALING

A. Protect decorative cement concrete pavement from prematurely drying and excessive cold or hot temperatures.

B. Cure decorative cement concrete pavement according to manufacturer's instructions.

C. Curing and Sealing Compound: Apply uniformly in continuous operation by sprayer or short nap roller according to manufacturer's instructions. After initial application is dry and tack free, apply a second coat.
   1. Do not over apply or apply in a single heavy coat.
   2. Thoroughly mix flatten paste in curing and sealing compound according to manufacturer's instructions. Stir occasionally to maintain uniform distribution of paste.

D. Do not cover concrete with plastic sheeting.

3.8 PAVEMENT TOLERANCES

A. Comply with requirements of Section 321313 - Concrete Paving.

3.9 REPAIRS AND PROTECTION

A. Repair damaged decorative cement concrete pavement according to manufacturer's instructions.
B. Clean spillage and soiling from adjacent construction according to manufacturer's instructions.

C. Protect decorative cement concrete pavement from damage or deterioration until date of Substantial Completion.

3.10 FIELD QUALITY CONTROL

A. Comply with requirements of Section 321313 - Concrete Paving.

END OF SECTION
SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.

B. Related Sections include the following:

1. Division 07 Section "Concrete Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
2. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT 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 or covered with frost.
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 MANUFACTURERS
   A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 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.

2.3 COLD-APPLIED JOINT SEALANTS
   A. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
      1. Products:
         a. Crafco Inc.; RoadSaver Silicone.
         b. Dow Corning Corporation; 888.

2.4 JOINT-SEALANT BACKER MATERIALS
   A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
      B. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine joints indicated to receive joint sealants, with installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
      1. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support 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 backer materials.
   2. Do not stretch, twist, puncture, or tear backer materials.
   3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below 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 sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
3.5 PROTECTION

A. 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 with repaired areas are indistinguishable from the original work.

END OF SECTION 321373
SECTION 321726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Detectable warning unit pavers.

B. Related Requirements:
   1. Section 321313 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.
   2. Section 321400 "Unit Paving" for unit paving installations incorporating detectable warning unit pavers specified in this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

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.

B. Weather Limitations for Adhesive Application:
   1. Apply adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when substrate is wet or contains excess moisture.

C. Weather Limitations for Mortar and Grout:

2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F higher.
   a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set unit pavers within 1 minute of spreading setting-bed mortar.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering and wear.
      b. Separation or delamination of materials and components.
   2. Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for tactile warning surfaces.

   1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

B. Source Limitations: Obtain each type of tactile warning surfacing, joint material, setting material, anchor, and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 DETECTABLE WARNING UNIT PAVERS

A. Detectable Warning Concrete Unit Pavers: Solid paving units, made from normal-weight concrete with a compressive strength of not less than 5000 psi, water absorption of not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67, with accessible detectable warning truncated domes on exposed surface of units.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Shapes and Sizes:
   a. Thickness: 2-1/2 inches at field of tile.
   b. Face Size: Nominal 24 by 24 inches Some manufacturers offer options listed in "Dome Spacing and Configuration" Subparagraph below; verify availability with manufacturers. Revise if different spacing and configurations are required by local jurisdictions.
3. Dome Spacing and Configuration: Manufacturer's standard compliant spacing and manufacturer's standard pattern.

B. Setting Bed: Comply with requirements in Section 321400 "Unit Paving."

C. Aggregate Setting Bed:
   2. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.
   3. 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.

D. Mortar Setting Bed:
   1. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
   2. Sand: ASTM C 33/C 33M.
   3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
   1. Furnish Type 304 stainless-steel fasteners for exterior use.
   2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.
C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

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

3.2 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.3 INSTALLATION OF DETECTABLE WARNING UNIT PAVERS

A. Unit Paver Installation, General:

1. Setting-Bed and Unit Paver Installation: Comply with installation requirements in Section 321400 "Unit Paving."
2. Mix unit pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
3. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
4. Tolerances: Do not exceed 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.

B. Aggregate Setting-Bed Applications:

1. Place aggregate base, compact by tamping with plate vibrator, and screed to depth indicated.
2. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until unit pavers are set and compacted.
3. Treat leveling course with herbicide to inhibit growth of grass and weeds.
4. Set unit 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.
5. 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.
6. 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.

C. Mortar Setting-Bed Applications:

1. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
2. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing mortar bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.
3. Apply mortar bed over bond coat; spread and screed mortar bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.
4. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Before placing pavers, cut back, bevel edge, and remove and discard setting-bed material that has reached initial set.
5. Place pavers before initial set of cement occurs. Immediately before placing pavers on mortar bed, apply uniform 1/16-inch thick bond coat to mortar bed or to back of each paver with a flat trowel.
6. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.
7. Spaced Joint Widths: Provide 3/8-inch nominal joint width with variations not exceeding plus or minus 1/8 inch.
8. Grouted Joints: Grout paver joints complying with ANSI A108.10. Grout joints as soon as possible after initial set of setting bed.
   a. Force grout into joints, taking care not to smear grout on adjoining surfaces.
   b. Tool exposed joints slightly concave when thumbprint hard.
   c. Cure grout by maintaining in a damp condition for seven days unless otherwise recommended by grout or liquid-latex manufacturer.
9. Remove excess grout from exposed paver surfaces; wash and scrub clean.
10. Protect installation from traffic until grout has set.

3.4 CLEANING AND PROTECTION

A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.
END OF SECTION 321726
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Execute the work of this Specification in accordance with applicable portions of:
   1. Division 1 – General Requirements

1.2 SUMMARY

A. Section Includes:

   1. Seeding.

B. Related Sections:

   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
   3. Division 32 Section "Plants" for plantings.

1.3 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliants, or desiccants.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 EXTERNAL DOCUMENTS


1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

1.6 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Certification of each seed mixture to be utilized for the project. Include identification of source and name and telephone number of supplier.

B. Qualification Data: For qualified landscape Installer.

C. Product Certificates: For soil amendments and fertilizers, from manufacturer.

D. Material Test Reports: For existing in-place surface soil and imported topsoil.

E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
   1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
   2. Experience: Three years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
      a. Certified Landscape Technician - Exterior, with specialty area(s), designated CLT-Exterior.
      b. Certified Turfgrass Professional, designated CTP.
c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.

5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
   a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for lime, nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
   b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Pre-installation Conference: Project Site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Sod: (NOT USED).

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.9 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance.
1. Spring Planting: March 15 – June 15
2. Fall Planting: September 15 – November 15

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.10 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 90 days from date of installation.
   a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

2. Sodded Turf: (NOT USED)

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS


2.2 TEMPORARY STABILIZATION SEED

A. Grass Seed: Mix no. 5 (annual ryegrass) in accordance with detail de-esc-3.4.3, sheet 1 of 4 within the Delaware Erosion and Sediment Control Handbook.

B. Seed Species: Annual Ryegrass. Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
   1. All areas: Annual Ryegrass (Lolium temulentum).
   2. Apply at 125#/acre.
   3. Planting depth, 0.5 inches.

2.3 PERMANENT GRASS SEED

A. Apply mix No. 7 in accordance with DE-ESC-3.4.3, sheet 2 of 4 within the Delaware Erosion and Sediment Control Handbook.
   1. All areas: Mix No. 7
   2. Apply at 150#/acre.
2.4 WILD FLOWER MEADOW GRASS SEED

A. Apply mix ERNMX-168 in accordance with manufacturers recommendations Ernst Conservation Seeds, Meadville, PA or approved equal.
   1. All areas: ERNMX-168
   2. Apply at: 8.5 lb / acre

2.5 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 85 percent calcium carbonate, ground so that not less 90% passes a 10 mesh sieve and not less than 30% passes a 100 mesh sieve. Apply at the rate adequate to bring pH range up to 6.0 to 6.5.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.6 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through ½ inch sieve; soluble salt content of 4 to 8 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

2.7 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. 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.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
3. For lawns, provide fertilizer with not less than 4% phosphoric acid and not less than 2% potassium and the percentage of nitrogen required to provide not less than 1 lb. of actual nitrogen per 1000 sq. ft. of lawn area. Provide nitrogen in a form that will be available to the lawn during the initial period of growth.

2.8 PLANTING SOILS

A. TOPSOIL

Topsoil shall be from off-site sources. It shall be without admixture of subsoil or slag and shall be free of stones, lumps, plants or their roots, sticks and extraneous matter, and shall not be moved, placed or used while in a frozen or muddy condition.

Topsoil from off-site sources shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than 5% organic matter as determined by the "Walkley-Black Method" (Colorimetric version). Sufficient limestone shall be added to topsoil used to bring it to a range of pH 6.0 to pH 6.5.

Soil sample tests will be ordered by the Landscape Architect and shall be made by a state or commercial laboratory using methods approved by the Associates of Official Agricultural chemists or the State Agricultural Experiment Station.

Such analysis will be paid for by the Contractor. Moving and placing of topsoil may be made after approval of the analysis by the Landscape Architect.

If approved, natural topsoil not having the hydrogen-ion value specified above may be amended by the contractor, at his own expense, to bring it within the specified limits. Topsoil shall meet the following mechanical analysis:

<table>
<thead>
<tr>
<th>Passing %</th>
<th>Retained %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; Screen</td>
<td>100%</td>
</tr>
<tr>
<td>1/2&quot; Screen</td>
<td>97-100%</td>
</tr>
<tr>
<td>No. 100 Mesh Sieve</td>
<td>60-40%</td>
</tr>
</tbody>
</table>

There shall be a minimum of 4" of topsoil (after settlement) in all plant beds, pit plantings, ground cover areas, and lawns or as called for on the drawings whichever is greater.

B. LIGHT WEIGHT ON-STRUCTURE PLANTING SOIL (NOT USED)
2.9 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Hardwood Bark Mulch (Shredded).
   1. Shredded Hardwood Bark Mulch made of various hardwoods, mostly Oak, is ground (hammer milled) through a screen to provide a shredded, fibrous material. This is coarse mulch with large pieces down to fines. The pH shall range between 6 and 7.

C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content 2-5 percent; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content 50-60 percent of dry weight.
   2. Feedstock: (NOT USED).

E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.10 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.11 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples.
C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surfaces. Include manufacturer's recommended anchorage system for slope conditions.

2.12 GRASS-PAVING MATERIALS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil off-site before spreading.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
b. Mix lime with dry soil before mixing fertilizer.

2. Spread planting soil 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.

a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.

b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is 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 6 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 inch 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.

D. 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 finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of as noted on plans.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 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 thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

G. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with [fiber-mulch manufacturer's recommended tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than [1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.7 TURF RENOVATION

A. Renovate existing turf.

B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches

I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.8 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.
3.9 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent, over and bare spots not exceeding 5 by 5 inches.

2. Satisfactory Sodded Turf: (NOT USED).

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200
SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 Specification Sections, apply to this Section. Execute the work of this Specification in accordance with applicable portions of:

1. Division 1 - General Requirements

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.
3. Tree stabilization.

B. Related Sections:

1. Division 31 Section "Site Clearing" for protection of existing trees and plantings, topsoil striping and stockpiling, and site clearing.
2. Division 32 Section "Turf and Grasses" for turf (lawn), sod (alternate to bid) and meadow planting, hydro-seeding, and erosion-control materials.

1.3 ALLOWANCES

A. Allowances for plants are specified in Division 01 Section “Allowances.”

1. Perform planting work under quantity allowances and only as authorized. Authorized work includes: Unless specifically excluded hereinafter under RELATED SECTIONS: provide labor, materials, equipment and services necessary and incidental to complete work described by this Section's title shown above. Work includes, but is not necessarily limited to:

   a. Fine Grading.
   b. Providing and Placing all Off-site Topsoil and Planting Soil Backfill Mix required to complete Landscape Development Work.
c. Preparation of Planting Areas as required.
d. Furnishing and installing all Plant Material.
e. Furnishing and installing all River Jack Mulch
f. Furnishing and installing all Bed Edging
g. Maintenance of all Work until Final Acceptance (not less than 60 days).
h. Clean-up of Work Area as outlined in these specifications.

2. Notify Landscape Architect weekly of extent of work performed that is attributable to quantity allowances.
3. Perform work that exceeds quantity allowances only as authorized by Change Orders.

B. Work By Others;
   1. Installation of Bituminous Parking Lots and Drives.
   2. Installation of Curbs, Concrete Walks and Wheel Stops.
   3. New Building.
   4. Site Furniture, Flag Poles

1.4 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Division 01 Section "Unit Prices."
   1. Unit prices apply to authorized work covered by quantity allowances.
   2. Unit prices apply to additions to and deletions from Work as authorized by Change Orders.

1.5 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

H. Finish Grade: Elevation of finished surface of planting soil.

I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and mollusicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

L. Planting Area: Areas to be planted.

M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

S. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including soils.

2. Pesticides and Herbicides: Include product label and manufacturer’s application instruction specific to the Project.
3. Plant Photographs: Include color photographs in either digital or 3- by 5-inch (76- by 127-mm) print format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 10 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. Trees and Shrubs: Contact Landscape Architect for review of plant material, based on information received above in product data. The Landscape Architect reserves the right to inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for name, variety, size and quality. Provide trees and shrubs grown in a recognized nursery in accordance with good horticultural practice. Provide healthy, vigorous stock grown under climatic conditions similar to conditions in the locality of the project and free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions or disfigurement. Provide trees and shrubs of the sizes shown as specified. Trees and shrubs of larger size may be used, if acceptable to Landscape Architect, and if sizes of roots or balls are increased proportionately.
2. Mulch: one quart volume of each organic mulch required, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Filter Fabric: 12 x 12" sample, with manufacturer specifications.

1.7 INFORMATIONAL SUBMITTALS

A. Qualifications: The Landscape Work shall be done by a single firm specializing in landscaping work. Include list of similar projects completed, demonstration Installer’s capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners’ contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. General: Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulation applicable to landscape materials.
2. Manufacturer’s certified analysis of standard products.
3. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Material Test Reports:
1. Certification: For information only, submit 2 copies of certificates of inspection as required by governmental authorities, and manufacturers or vendor's certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

D. Maintenance Instructions: Maintenance Instructions: Submit two copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

E. Provide two copies of warranty (See Item 1.11 for specific requirements).

F. Schedule of Work: For information only, submit 3 copies of tentative schedule to Owner and/or Owner's Agent along with Landscape Architect. Contractor shall keep all parties above apprised of any changes so that the Owner's Agent is aware of scheduled work at least 24 hours prior to said work being started.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Provide Professional Memberships.
2. Provide number of years' experience in Landscape Installation in addition to requirements in Division 01 Section “Quality Requirements”
3. Provide Field Supervision installers experience. Note full-time Supervisor to be on Project Site at all times when landscape installation is in progress.
4. Pesticide Applicator: Licensed

B. Provide Soil-Testing Laboratory Name and Qualifications.

C. Soil Analysis: For each un-amended soil type, furnish soil analysis and a written report by a qualified soil testing laboratory stating percentages of organic matter, gradation of sand, silt, and clay content; cation exchange capacity, deleterious material, pH, and mineral and plant nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Landscape Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
   a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq ft or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
   b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1. Do not make substitutions: If specified landscape material is not obtainable, submit to Landscape Architect proof of non-availability and proposal for use of equivalent material. When authorized, adjustment of contract amount will be made.

PLANTS 329300-5
E. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Landscape Architect of sources of planting materials 14 days in advance of delivery to site.

F. Hardscape Materials: Materials and methods of construction shall comply with American Society for Testing and Materials (ASTM). Installation shall be performed by skilled workmen with a satisfactory record of performance on completed projects of comparable size and quality. Do not change source of Hardscape Materials during the course of the work.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable. Protect materials from deterioration during delivery, and while stored at the site. Materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, and soil amendments with appropriate certificates.

C. Plant Materials:

1. Bare-Root Stock: NOT USED.
2. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, 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 plants during shipping and delivery. Do not drop plants during delivery and handling.
3. Label at least one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.
4. Do not remove container grown stock from containers until planting time.
5. Handle planting stock by root ball.
6. Bulbs: NOT USED
7. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six (6) hours after delivery, set plants and trees in their appropriate conditions, protect from weather and mechanical damage, and keep roots moist.

   a. Set balled stock on ground and cover ball with soil, peat moss, or other acceptable material.
   b. Do not remove container-grown stock from containers before time of planting.
c. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary, to maintain root systems in a moist, but not overly-wet condition.

1.10 PROJECT CONDITIONS

A. Field Measurements: Installer must verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work. Installer must observe the conditions under which work is to be performed, and notify the Landscape Architect of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify the Landscape Architect/ Construction Manager and or Owner no fewer seven days in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without Construction Managers and or Owner’s written permission.

C. Planting Restrictions: Proceed with and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

E. Planting Schedule: Prepare a proposed planting schedule. Schedule the dates for each type of landscape work during normal seasons for such work in the area of the site. Correlate with specified maintenance periods to provide required maintenance from date of Substantial Completion.

F. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the Landscape Architect. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

G. Protect existing trees, shrubs and other hardscape elements against damage including trespassing, and erosion.

H. Protect all existing plant material in the area of this contract, whether inside or outside the contract limit line, against any damage, which in the opinion of the Landscape Architect will cause death or major retardation. Such material shall be replaced with same size and species by the Contractor at no additional cost should such damage occur.

I. Inspection of work will be made at the conclusion of work (at acceptance of the project). Submit written notice requesting final inspection at least 10 days prior to anticipated date.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to the following:
a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond contractor’s control.
b. Structural failures including plantings, falling or blowing over.
c. Structural failures of tree stabilization structures, or stone energy dissipaters

2. Warranty periods will begin from the Date of installation completion (as determined by the Landscape Architect for a period of 12 months (one year).

3. Include the following remedial actions as a minimum.
   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement for each plant will be required except for losses or replacements due to failure to comply with requirements.
   d. Provide extended warranty for a period equal to the original warranty period, for replaced plant material.

1.12 MAINTENANCE

A. All planted trees, shrubs, groundcovers and annual flowers, shall be maintained until final acceptance of the completed contract. This shall be not less than 60 days. Maintenance shall include watering, cultivating, control of insects, fungus, and other horticultural operations necessary for the proper growth of all plants.

** END OF PART 1 **
PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings L-101. and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders (unless otherwise indicated); tight vertical branches where bark is squeezed between two branches or between branch and trunk (“included bark”); crossing trunks; or with stem girdling roots will be rejected.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 "Standard for Nursery Stock" for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls. Provide plant materials true to name and variety established by the American Joint Committee on Horticultural Nomenclature "Standardized Plant Names," Second Edition, 1942.

C. Deciduous Trees: Provide trees of height and caliper listed or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are shown or listed.

1. Provide balled and burlapped (B&B) deciduous trees.
2. Container grown deciduous trees will be acceptable in lieu of balled and burlapped deciduous trees subject to specified limitations of ANSI Z60.1 for container stock.

D. Deciduous Shrubs: Provide shrubs of the height shown or listed and with not less than the minimum number of canes required by ANSI 260.1 for the type and height of shrub required.

1. Provide balled and burlapped (B&B), bare root (B.R.) or container deciduous shrubs as specified in plant list.
2. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to the specified limitations for container grown stock.

E. Coniferous and Broadleaved Evergreens: Provide evergreens of the sizes shown or listed. Dimensions indicate minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf cone, pyramidal, broad upright and columnar. Provide normal quality evergreens with well-balanced from complying with requirements for other size relationships to the primary dimension shown.

1. Provide balled and burlapped (B&B) or container grown evergreens as specified.
2. Container grown evergreens will be acceptable in lieu of balled and burlapped evergreens subject to the specified limitations for container grown stock.

F. Labeling: label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

G. If formal arrangements or consecutive order of plants is shown on plans, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
H. Annuals and Biennials – Optional for Client determination. Provide healthy, disease-free plants, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 INORGANIC SOIL AMENDMENTS

A. Ground Limestone: (To be incorporated into soil if soil pH value test shows low level of soil Ph which needs to be raised.). ASTM C 602, natural limestone containing not less than 85% of total carbonates, ground so that not less 90% passes a 10 mesh sieve and not less than 30% passes a 100 mesh sieve. Apply at the rate adequate to bring pH range up to 6.0 to 6.5.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No.6 sieve and a maximum of 10 percent passing through No. 40 sieve.

C. Iron Sulphate: Granulated ferrous sulfate containing a minimum of 20 percent and 10 percent sulfur. (To be incorporated into soil if soil pH value test shows high level of soil pH which needs to be lowered.) Iron Sulphate shall be applied at the rate adequate to bring pH range down to 6.0 to 6.5 and as per "Cornell Recommendations for Commercial Turf Grass Management".

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2 inch sieve; soluble salt content of 4 to 8 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight

2. Feedstock: NOT USED

B. Peat Humus: FS Q-P-166 and with the texture and pH range OF 3.4 TO 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
D. Wood Derivatives: NOT USED

E. Manure: NOT USED

2.4 FERTILIZERS

A. Bonemeal: Commercial, raw, or steamed, finely ground; 4% nitrogen and 20% phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, Soluble; a minimum of 20% available phosphoric acid.

C. 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.

1. For All New Trees and Shrubs:

All trees and shrubs shall be fertilized with a controlled release 16-8-16 analysis fertilizer contained in a polyethylene perforated bag with micropore holes. The bag shall contain four (4) ounces minimum of water soluble fertilizer so as to be effective for eight (8) years.

The packets shall be placed equidistantly within the planting pit adjacent to the ball or root mass, but not in direct contact with roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged. If it becomes necessary to remove and replace dead or unhealthy plants, damaged or broken packets shall be replaced with new packets.

A "Certificate of Compliance" must accompany invoice showing quantity of material ordered, where material was supplied and shipped to, and its consigned route and specific job application.

2. For lawns, provide fertilizer with not less than 4% phosphoric acid and not less than 2% potassium and the percentage of nitrogen required to provide not less than 1 lb. of actual nitrogen per 1000 sq. ft. of lawn area. Provide nitrogen in a form that will be available to the lawn during the initial period of growth.

D. Organic Fertilizer and Soil Conditioner: All trees and shrubs shall be treated with PHC Healthy Start which contains a blend of natural organic nutrients, proteins, sugars and other carbohydrates, humic acids, biostimulants and beneficial bacteria that enrich soil.

PHC Healthy Start is available from Plant Health Care, Inc., 440 William Pitt Way, Pittsburgh, Pennsylvania, 1-800-421-9051. (Or approved equal)

2.5 PLANTING SOILS

A. TOPSOIL

Topsoil shall be from off-site sources. It shall be without admixture of subsoil or slag and shall be free of stones, lumps, plants or their roots, sticks and extraneous matter, and shall not be moved, placed or used while in a frozen or muddy condition.

Topsoil from off-site sources shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than 5% organic matter as determined by the "Walkley-Black Method" (Colorimetric version). Sufficient limestone shall be added to topsoil used to bring it to a range of pH 6.0 to pH 6.5.
Soil sample tests will be ordered by the Landscape Contractor and shall be made by a state or commercial laboratory using methods approved by the Associates of Official Agricultural chemists or the State Agricultural Experiment Station.

Such analysis will be paid for by the Contractor. Moving and placing of topsoil may be made after approval of the analysis by the Landscape Architect.

If approved, natural topsoil not having the hydrogen-ion value specified above may be amended by the contractor, at his own expense, to bring it within the specified limits. Topsoil shall meet the following mechanical analysis:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Passing %</th>
<th>Retained %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; Screen</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>1/2&quot; Screen</td>
<td>97%-100%</td>
<td>0%-3%</td>
</tr>
<tr>
<td>No. 100 Mesh Sieve</td>
<td>60%-40%</td>
<td>40%-60%</td>
</tr>
</tbody>
</table>

There shall be a minimum of 4" of topsoil (after settlement) in all plant beds, pit plantings, ground cover areas, and lawns or as called for on the drawings whichever is greater. 12" for annual plant beds.

2.6 MULCHES

A. River Jack Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Mulch: Shall be 1-3" Delaware river stone of varying size, shape, and color.
2. Color: No artificial, dyes or colorant will be allowed.
3. Depth: River Jack Mulch shall be a minimum depth of 4" throughout.

B. Compost Mulch: NOT USED

2.7 WEED-CONTROL BARRIERS – NOT USED

2.8 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, treated softwood with specified wood pressure-
preservative treatment, free of knots, holes, cross grain, and other defects, (2” by 2” by 5’-0” min), pointed at one end, 3 per tree.
2. Wood Deadmen: NOT USED

B. Root-Ball Stabilization Materials: NOT USED

2.10 LANDSCAPE EDGINGS – NOT USED
2.11 TREE GRATES – NOT USED

2.12 MISCELLANEOUS LANDSCAPE MATERIALS
A. Anti-Desiccant: Emulsion type, film-forming agent similar to Dowax by Dow Chemical Co., or Wilt-Pruf by Nursery Specialty Products, Inc., 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. All plants shall be sprayed with an anti-desiccant once in late Fall (November) and once in late Winter (February).
B. Wrapping: Tree-wrap tape not less than 4” wide, designed to prevent borer damage and winter freezing.
C. Filter Fabric: Filter weave 40/10 as manufactured by Nicolon/Mirafi Group. (Or approved equal). Filter weave 40/10 is available from Ragen Associates. 20 Larsen Rd., Iselin, NJ 08830, (732)602-9500 or (800)752-1010 outside NJ.

** END OF PART 2 **
3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Apply anti-desiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again two weeks after planting.

E. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

A. Rough grade will be left 4” below finished grade by others. Loosen subgrade of lawn areas to a minimum depth of 4”. Remove stones over 1” in any dimension and sticks, roots, rubbish and other extraneous matter and legally dispose them off Owner’s property. Limit preparation to areas, which will be planted promptly after preparation.

1. Spread topsoil to minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement (4” after settlement). Place approximately 1/2 of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remains of topsoil. Add specified soil amendments (as per Section 3.19-B of this specification) and mix thoroughly into the upper 4 inches of topsoil.
2. Where final grades are not indicated, finish grades shall be of uniform level or slope between points for which elevations are given or from such points to existing grades, except that tops and bottoms of banks shall be rounded. Subgrade elevations shall be understood to be the specified depth below finished grades.

3. Moistened prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before seeding. Do not create a muddy soil condition.

4. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45 degree angle. Excavations with vertical sides are not acceptable. Leave center bottom of excavation slightly raised at center to provide proper drainage. Ensure that root ball will sit on undisturbed base soil to prevent settling. Loosen hard subsoil in bottom of excavation.

1. For balled and burlapped (B&B) trees and shrubs, make excavations at least the equivalent of two and a half times as wide as the ball radius and equal to the ball depth, plus the following allowance for setting of ball on a layer of compacted backfill: Allow for 6” setting layer of planting soil mixture.

2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

3. Do not excavate deeper than the depth of the root ball, measured from the root flare to the bottom of the root ball.

4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

5. Maintain required angles of repose of adjacent material as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

6. Maintain supervision of excavations during working hours.

7. Keep excavations covered or otherwise protected after working hours, overnight and when unattended by contractor’s personnel.

B. Subsoil and topsoil removed from excavations MAY NOT be used as planting soil.

C. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Landscape Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the tip-most root emerges from the trunk. After soil removal to expose the root flare, verify that the root ball still meets size requirements.
B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 3 inches above adjacent finished grade.

1. During the placement of backfill place "Unique Fertilizer Packets" as specified in section 2.4 C as follows:

<table>
<thead>
<tr>
<th>Types of Plants</th>
<th>No. of Packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Trees:</td>
<td></td>
</tr>
<tr>
<td>Over 4 inch caliper</td>
<td>4</td>
</tr>
<tr>
<td>1 to 4 inch caliper</td>
<td>3</td>
</tr>
<tr>
<td>Over 6 feet high</td>
<td>4</td>
</tr>
<tr>
<td>3 to 6 feet high</td>
<td>3</td>
</tr>
<tr>
<td>15 to 36 inches high</td>
<td>2</td>
</tr>
<tr>
<td>Under 15 inches high</td>
<td>1</td>
</tr>
<tr>
<td>b. Shrubs:</td>
<td></td>
</tr>
<tr>
<td>Over 3 feet high</td>
<td>3</td>
</tr>
<tr>
<td>2 to 3 feet high</td>
<td>2</td>
</tr>
<tr>
<td>Under 2 feet high</td>
<td>1</td>
</tr>
</tbody>
</table>

The packets shall be placed equidistantly within the planting pit adjacent to the ball or root mass, but not in direct contact with roots. Placement depth shall be 6 to 8 inches. Packets shall not be cut, ripped or damaged. If it becomes necessary to remove and replace dead or unhealthy plants, damaged or broken packets shall be replaced with new packets.

2. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill. Remove collar ropes only. Retain burlap on balls.

D. Set bare root stock on cushion of planting soil mixture. Spread roots, then carefully work backfill around roots by hand and puddle with water until backfill layers are completely saturated. Plumb before backfilling and maintain plumb while working backfill around roots and placing layers above roots. Set collar 1" to 2" above adjacent finish landscape grades. Spread cut roots without tangling or turning up to surface. Cut injured roots clean, do not break.

E. Set container grown stock as specified for balled and burlapped stock, except cut cans on two sides with an approved can cutter; remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.

F. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope: the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

G. Dish top of backfill to allow for mulching. For Spring planting, provide additional backfill berm around edge of excavations to form shallow saucer to collect water.

1. Note: Surface of all Shrub Beds shall be crowned or sloped as required to achieve a 3% minimum surface pitch and insure positive surface drainage.
H. Wrap tree trunks of 2" caliper and larger. Start at ground and cover trunk to height of first branches and securely attach. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures required before wrapping.

3.6 MECHANIZED TREE SPADE PLANTING – NOT USED

3.7 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by the Landscape Architect, do not cut tree leaders, and remove only injured or dead branches from flowering trees, if any. Prune shrubs to retain natural character and accomplish their use in the landscape design. Required shrub sizes are the size after pruning.

1. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

2. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

A. Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension shown on Drawings. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.

3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.9 ROOT-BARRIER INSTALLATION – NOT USED

3.10 PLANTING IN PLANTERS - NOT USED

3.11 GROUND COVER AND PLANT PLANTING – NOT USED

3.12 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and tree like shrubs in Turf Areas: Apply mulch ring of 3inch thick with 36 inch radius around trunks or stems. Do not place mulch within six inches of trunk or stems.

2. Organic Mulch in Planting Areas: Apply three inches thickness of organic mulch or stone extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finished grades. Do not place mulch within three inches of trunks or stems.

3. Mineral Mulch in Planting Areas: Apply 3 inch average thickness of mineral mulch over whole surface area as shown on plans, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.
3.13 EDGING INSTALLATION – NOT USED

3.14 TREE GRATE INSTALLATION – NOT USED

3.15 PLANT MAINTENANCE

A. Begin maintenance immediately after planting. Maintain trees, shrubs and other plants until final acceptance, but in no case less than the following period: 60 days after planting.

B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

E. Submit two copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of landscape work for one full year. Submit prior to the expiration of required maintenance period(s).

3.16 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.17 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. During landscape installation, store materials and equipment where directed.

B. Protect landscape work and material from damage due to landscape operations, operations of other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

C. After installation and before final inspection, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.18 DISPOSAL
A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

3.19 PREPARATION OF PLANTING SOIL

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps and other extraneous materials harmful or toxic to plant growth.

B. Mix specified soil amendments at required rates (derived from Topsoil Analysis Report). Also include the following:

1. For Trees and Shrubs (excluding coniferous ground cover): PHC Healthy Start 3-4-3 organic fertilizer/soil conditioner, shall be applied at 1/2 lb. per trunk diameter (cal.) inch for trees.

   For shrubs as follows:

<table>
<thead>
<tr>
<th>Plant Size</th>
<th>Rate Cups</th>
<th>Lbs.</th>
<th># Plant Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gallon</td>
<td>1/2</td>
<td>1/4</td>
<td>100</td>
</tr>
<tr>
<td>5 Gallon</td>
<td>1</td>
<td>1/2</td>
<td>50</td>
</tr>
<tr>
<td>15 Gallon</td>
<td>2</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>24” Ball/Box</td>
<td>3</td>
<td>1 1/2</td>
<td>16</td>
</tr>
<tr>
<td>36” Ball/Box</td>
<td>5</td>
<td>2 1/2</td>
<td>10</td>
</tr>
<tr>
<td>42” Ball/Box</td>
<td>6</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>54” Ball/Box</td>
<td>8</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>72” Ball/Box</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

C. Planting Soil Mixture: Shall consist of one part off-site topsoil, as required, one part clean coarse builder’s sand and one part humus. These shall be thoroughly mixed prior to any planting operations. The preceding shall be mixed with the soil amendments in Section 3.19 B.

D. Lightweight Soil Mixture: (NOT USED)

E. For pit and trench type planting, mix planting soil prior to back filling and/or placing stockpile at the site.

F. For planting beds, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

** END OF PART 3 **

END OF SECTION 329300